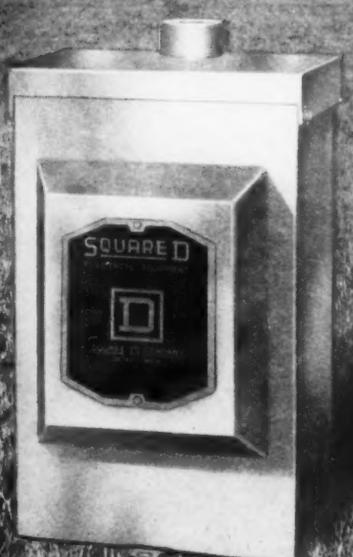
FOR RURAL ELECTRIFICATION . . .

Specify MULTI-BREAKERS

The proved advantages of the Square D Multi-breakeR are particularly important on rural lines, where long distances and weather conditions make fuse replacement an annoying problem. . . . The Multi-breakeR provides circuit breaker protection at very low cost. It eliminates provoking lapses of service. . . . When you go after rural electrification jobs, use the Square D Multi-breakeR as your selling argument. It will get business for you—at an increased profit. . . . If you haven't the complete Multi-breakeR story, write for bulletin 543-B.

CALL IN A SQUARE D MAN



SQUARE D COMPANY

LOS ANGELES - MILWAUKEE - DETROIT

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

General Electric NOW *Offers You*

METAL-CLAD SWITCHGEAR

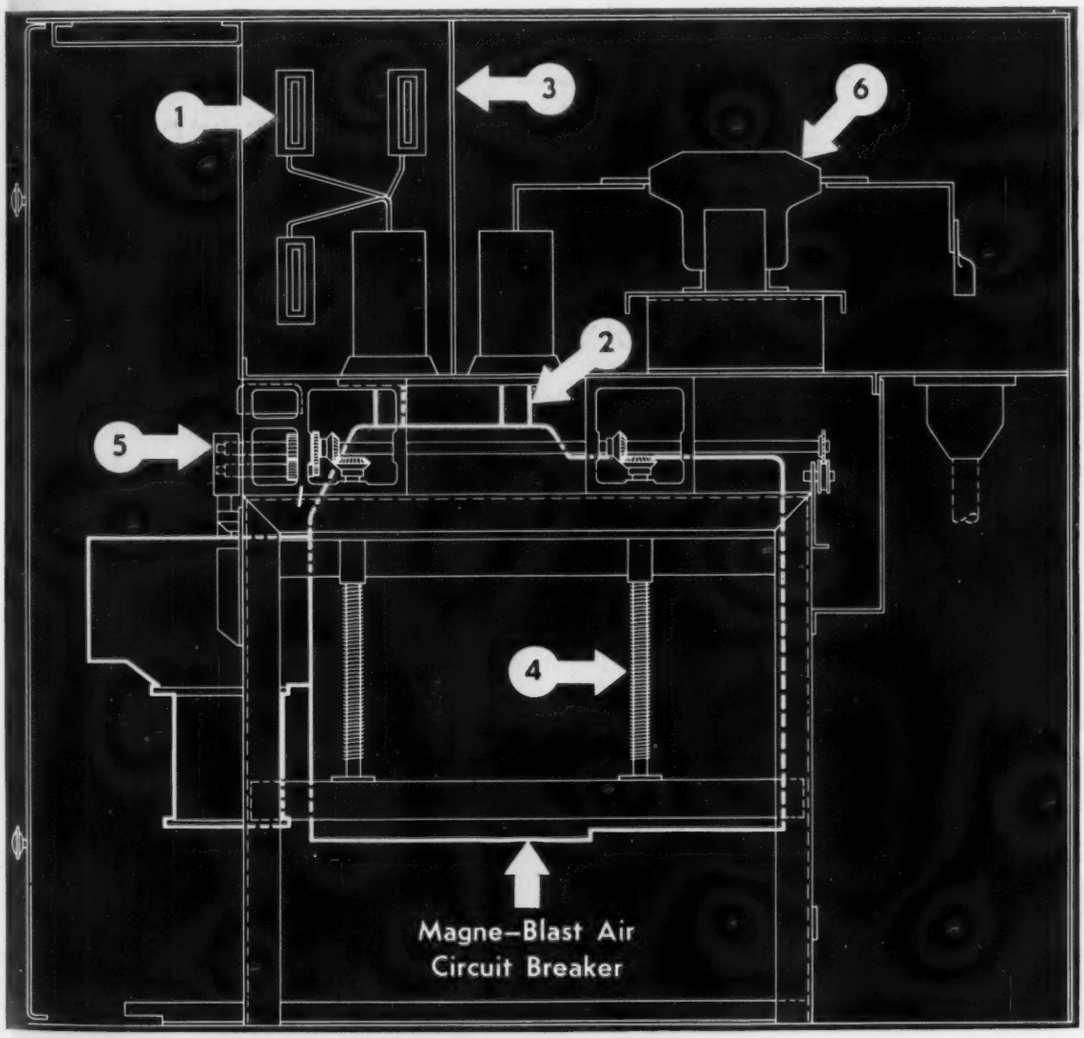
STANDARD MI-6 EQUIPMENT

And the New Magne-Blast Air Circuit Breaker for 5000-volt Service

Phantom Picture of the New Magne-Blast Breaker

with MAGNE-BLAST BREAKERS

including all vertical-lift master metal-clad features and the time-tested arrangement of circuit components



Not one of these features is sacrificed:

(1) High-dielectric, molded bus insulation

(2) Standard high-pressure disconnecting devices

(3) Complete circuit isolation

(4) The time-proved breaker-elevating mechanism

(5) The dependable, direct-acting mechanical interlocks

(6) Current transformers that are properly coordinated

(7) Silver-to-silver contacts throughout

(8) Semiflush mounting of instruments and relays

SEE THE G-E "HOUSE OF MAGIC" AT BOTH FAIRS

GENERAL ELECTRIC

880-37

Stocks at San Francisco
Electrical Specialty Co., Inc.,
316 Eleventh Street

Stocks at Los Angeles
Electrical Specialty Co. of So. Calif.,
451 South San Pedro Street

Stocks at Seattle
Electrical Specialty Co., Inc.,
714 Fourth Avenue

For the Coast Trade

At your doorstep you now have an adequate stock of popular D-H alloys, wires, ribbons, rods and other forms.

Driver-Harris Company
Harrison, N. J.

TRADE MARK REG. U.S. PAT. OFF.
Nichrome

TORK CLOCKS

NEW ELECTRICALLY DRIVEN 1939 MODELS NOW AVAILABLE

WITH PLAIN OR ASTRONOMIC DIALS

Whenever it is desired to turn Current on and off Regularly there is a new model Tork Clock that can do it.

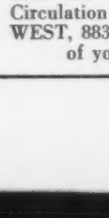
THE TORK CLOCK CO., Inc.
MOUNT VERNON, N. Y.

Representatives:
A. R. Slimmon, 445 E. 3d St., Los Angeles
Nicholas & Cook, 1063 Howard St., S. F.
H. M. Sayers, 1019 Eastlake Ave., Seattle
Stevens Sales Co., 41 P. O. Place, Salt Lake City

ELECTRICAL TESTING LABORATORIES

Electrical Photometrical, Chemical and Mechanical Tests. Inspection of Materials and Apparatus at Manufactory.

20th St. and East End Ave. New York



G.C.A.
Lamp Replacers
Lamp Base Removers
Cartridge Fuse Tongs
Switch Hooks

Send for Catalogue
We have been making safety tools for 24 years

THE G. C. A. Manufacturing Co.
Pittsfield, Mass.

Crapo GALVANIZED PRODUCTS

STEEL STRAND

Telephone and Telegraph Wire

Crapo Galvanized Wire and Steel Strand can be spliced and served without injury to the heavy, protective zinc coating. The perfect adhesion of this tough, ductile coating to the wire enables it to withstand sharp bending and twisting, produces corrosion-resisting joints, makes for longer life, lower maintenance costs.

Crapo Galvanized Seven-wire Steel Strand and Telephone Wire are readily available in all standard grades and sizes from representative Supply Jobbers.

INDIANA STEEL & WIRE CO.
MUNCIE, ◆ INDIANA

ARE YOU MOVING?

If so, remember that the post office does not forward magazines. Notify Circulation Dept., ELECTRICAL WEST, 883 Mission St., San Francisco, of your change of address.

age as well as low voltage during heavy-load periods. Regulators are available in the following ratings: 2,400 volts from 5 to 24 kva.; 4,800 volts from 5 to 37.5 kva.; 6,900 volts from 5 to 50 kva., and 11,500 volts from 10 to 75 kva., all single-phase, 60-cycle. If you want more information on this, write for Bulletin No. 510.

511:

SINGLE-SUCTION, single-stage, close-coupled utility pumps for every industry are illustrated and described in Allis-Chalmers' new 4-page leaflet. The pumps handle from 10 to 1,600 gpm. and use motors up to 75 hp. The pamphlet includes a cross-section of a typical unit with detailed description of each part. Numerous pictures show views and arrangements involving a variety of horizontal and vertical applications. Clip the coupon and ask for bulletin No. 409.

512:

A NEW KIND of bulletin is that published by I-T-E Circuit Breaker Co. Titled "Dan River Cotton Mills Install Ring-Tie Distribution System," it comprises an article like those which appear in magazines. Briefly, the story is a case history. It reads well and it contains worthwhile information.

LETTERS

Thanks

DEAR SIRS:

We have been buried under pressing demands recently and I have had no opportunity to thank you for the splendid treatment you gave us in the March issue of ELECTRICAL WEST.

The cover and the insert were all that a world's fair could desire in the electrical field, and we want you to know that we greatly appreciate your cordial friendship and this striking proof of it.

W. L. WRIGHT,
Manager, Magazine Division.
Golden Gate International Exposition

Add Sales Guide

DEAR SIRS:

We note very effective ad copy on pages 66 and 67 of the February, 1939, issue of your publication, and note also that the whole or parts thereof are copyrighted with all rights reserved.

Under what circumstances do you allow the use of the word "matchless" with some or all of the explanatory paragraphs? We are beginning a dealer-cooperative plan here similar to the plan we used with Sierra Pacific, and would like to use your idea embodied in the pages referred to . . .

A. J. SHAVER, Manager,
Western States Utilities Co.
Winnemucca, Nev.

Listing

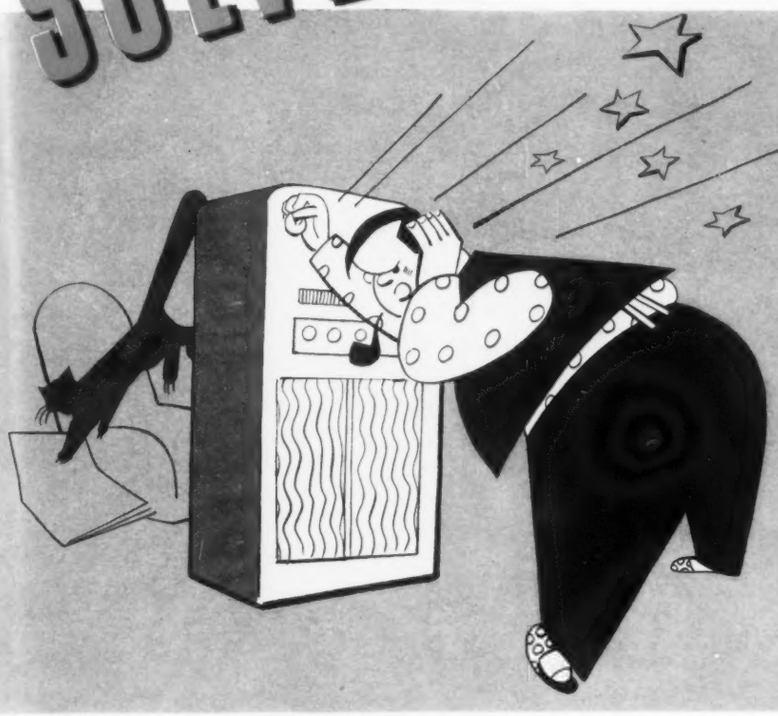
DEAR SIRS:

Isn't Salt Lake in the West, and doesn't our advertising in ELECTRICAL WEST mean as much in Utah, Idaho and Montana as it does in any place on the Pacific Coast, and if so, why does not ELECTRICAL WEST list the Salt Lake office as a branch office of the Edison General Electrical Appliance Co., Inc., in your Manufacturers' Directory?

B. E. ROWLEY.
District Sales Mgr.
Edison General Electric Appliance Co.
Salt Lake City

This lists it.—ED.

SOLVE THIS PROBLEM



WITH WESTINGHOUSE R·I·P INSULATORS

Free Your Customers from Radio Interference!

There is one best way to solve any problem . . . and the one best way to eliminate radio interference or distressing corona at the insulator is to install Westinghouse R-I-P (radio interference-proof) Insulators.

R-I-P Insulators are not new. As a matter of fact, they have been proved in thousands of major power company installations from coast to coast. R-I-P Insulators are a product of Westinghouse Research . . . were developed and patented by Westinghouse.

R-I-P Insulators have no added gadget to get out of order . . . do not require frequent and costly inspection. Distressing corona or radio interference due to capacity arcs are eliminated by a special metallic glaze that becomes part of the insulator itself during the ordinary firing process.

Westinghouse radio interference-proofing is permanent . . . lasts as long as the insulator itself. There is nothing to get out of order . . . and no corrodible metal to further embarrass radio reception among your customers.

Specify R-I-P Insulators. Overnight delivery through a nationwide chain of supply depots. Porcelain plants in Emeryville, Cal., and Derry, Pa. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pennsylvania. J-05047

THERE IS NO ADDED COST FOR WESTINGHOUSE R·I·P INSULATORS

Westinghouse Porcelain

W WESTINGHOUSE ELECTRIC

ELECTRA'S HUSBAND

Do Tell! A Bull Exerciser!

IT SURE was quiet around the house last Wednesday night. Electra had gone to Los Angeles to visit her sister, leaving the refrigerator well stocked with staples—and her husband well supplied with instructions. My first discovery was that housekeeping is a cinch—with all our electrical conveniences—and the further fact that it was only a short walk to the Royal Coffee Shop. But I did miss Electra's evening summary of the news, enlivened by her caustic banter.

It was my avowed intention to devote this spare time to some serious reading, but I had no more than started on the Edison Electric Institute Bulletin when my eye caught an item which sent me off into a reverie. I was so fascinated by the series of mental images which flowed, one from the other, that I found it virtually impossible to return to the consideration of low-voltage networks.

The interrupting idea jumped at me from page 86 of the March issue. It appears that New York is having an exposition which they so naively designate as a World's Fair—and in this Flatbush Fantasy they have dedicated an entire acre to demonstrate Electricity on the Farm—with 100 Practical Applications. Ninety-nine of these have long been familiar alike to farmers and electricians of the West, but they have a new one which will seemingly dominate the entire exhibit.

So help me, it's a Bull Exerciser! That's what it says in plain English. It's right out in front by the East entrance. You can't miss it!

We wouldn't think of doing such a thing at Treasure Island, even though the Effete East grants the Far West a certain amount of license in such matters. We may not be unduly modest, but we have learned to balance our native ebullience with a self-imposed restraint. If, perchance, there should be a bull exerciser at our Fair, the paying public will never know it.

To make matters worse, this whole electrified farm, including the bull exerciser, is sponsored by a committee which has on its roster such noble names as Charles W. Kellogg, Wendell L. Willkie, Edward J. Doyle, Harvey Couch, Louis Egan and Horace Liversidge. Can it be possible that they have forgotten the Federal Trade Commission and its 88 volumes of investigation? Have they forgotten the Administration and its Appeasement Policy?

We might well brag about the electrical hen and the electrical horse and even the electrical sow—but why mention the electrical bull? Of course, the SEC demands that we publish all the facts, but isn't this going a bit too far? Do we need add anything to what already has been said by Senator Norris and Representative Rankin—not to mention the seldom-silent secretary, Harold Ickes?

It would not be so bad if this exhibit were being shown somewhere else—Texas, for instance—but in New York, where the nuances of our language are not understood by so large a percentage of the population, there is only one connotation for Bull—and, by association of ideas, a bull exerciser would be something in the nature of a forensic gymnasium. As they groped for a connection between this and our great industry, inevitably they would recall what they had seen in the tabloids or had been told by some socially minded pedagogue in a night school.

I see them coming up to the East Entrance of the electrical acre, taking one glance at this featured device and then saying, "There! What did I tell you?" And what can the industry say in rebuttal? Not a word! It's the Edison Electric Institute's Bull Exerciser and they will either have to remove it, and reduce the 100 Practical Applications to the 99 that would be considered advisable on the Pacific Coast, or they must leave it there and hope that most of the patrons will come in through the West Gate.

There is another feature of the electrical farmstead that caused me to elevate my eyebrows momentarily. Near the southeast corner of the acre is a "milking parlor." That, fellows, is endowing the dairy industry with real dignity. During the day, the contented cow chews her cud by a sylvan brook and at sunset she is ushered into the parlor for the routine ministrations amid surroundings designed to contribute to her equanimity. This also will be enlightening to the Eastsiders who always have been of the opinion that milk is something that comes from a bottle, and to whom a parlor is an institution associated with ice cream or cosmetics or an undertaker.

During the last 25 years the West has taken great strides in softening its language. The indigent is now a client, the cemetery has become a memorial park, "Gents" has advanced to the status of restroom, all stenographers are now secretaries, the press agent is a public-relations consultant and so, in time, we may do our milking in the parlor.

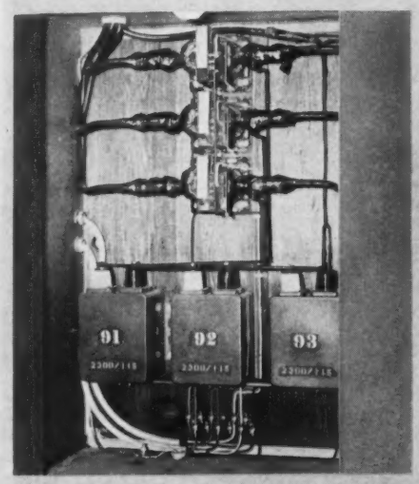
New Yorkers do not like to be reminded that their discoveries and innovations frequently have their origin in other locations and, indeed, are occasionally quite mature when Manhattan claims them as her own infants. The skyscraper, for example, came from Chicago. On the radio the other night I heard a New York "novelty" which was a Western favorite during the period of the World War. Also it is my recollection that San Jose had electric street lights several years before they appeared on Broadway.

And so it goes. And so we are pleased to see their world's fair feature so many of the electrical applications which are the products of Western ingenuity. All but the Bull Exerciser and the Milking Parlor! We make no claim for them.

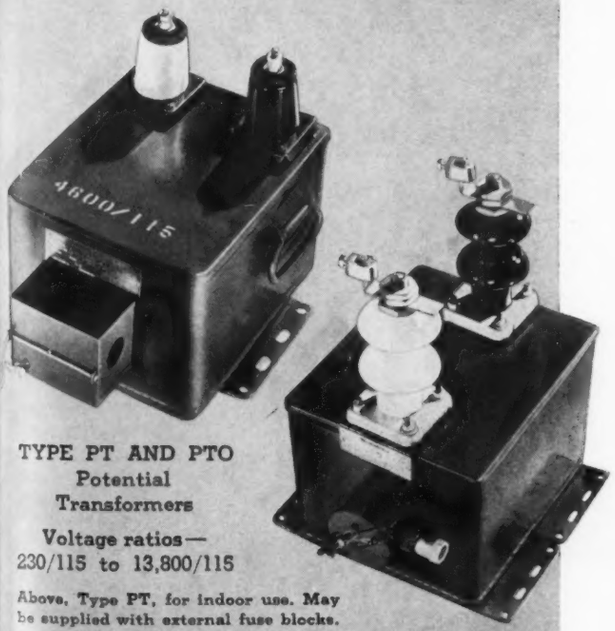
DOWN Los Angeles way they are celebrating the opening of the new Union Station—a magnificent structure set in a sub-tropical park. By press, radio and newsreel, its marvels will be told to the world. However, the purveyors of superlatives have not mentioned one item—that this is the slowest-built railroad project in history, having been prominently before the public for at least 20 years, and under construction for as long a period as was required by the Big Four to cross the Sierras. Theodore Judah began his survey of the Dutch Flat route in the fall of 1860, the Central Pacific Railroad Co. of California was incorporated on June 28, 1861, work was started at Sacramento Jan. 8, 1863 and the golden spike was driven at Promontory Point on May 10, 1869. In the meantime there was a war. All of which has nothing to do with the electrical industry except to suggest that so far as possible we cling to the spirit of the pioneers.

LIGHTNING SURGES

CAN'T HURT THESE POTENTIAL TRANSFORMERS



An installation of 2300-volt PT Transformers, metering the load of a large High School.



TYPE PT AND PTO Potential Transformers

Voltage ratios—
230/115 to 13,800/115

Above, Type PT, for indoor use. May be supplied with external fuse blocks. Right, Type PTO, for outdoor use, comes with stud-type bushings and solderless connectors.

Potential Transformers have to absorb a lot of grief,

so Westinghouse provides *double* protection against impulse voltages, to insure continuous, reliable performance.

DOUBLE PROTECTION INSURES SERVICE

Absolute surge protection is provided by new type of compound insulation, plus the use of stud-type bushings. Westinghouse PT's combine the advantages of dry-type construction with insulation strength greater than is possible with oil-filled construction.

EASY TO INSTALL—EASY TO MOVE

PT's can be mounted in any position — even upside down. Useless weight and bulk are eliminated. Case is welded and hermetically-sealed, and is filled by a vacuum process that prevents bubbles and void spaces. No fire hazard to worry about. And the cost is LOW.

Ask any Westinghouse office for detailed information, technical data and prices. Write for B. 2138, describing the Westinghouse line of Instrument Transformers. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-70180

Westinghouse Transformers

WESTINGHOUSE ELECTRIC

60,000 ITEMS FOR EVERY ELECTRICAL NEED

Your Graybar salesman brings to you a single source of *all* the electrical products you are likely to need . . . whatever that need may be.

Electrical buyers of all kinds . . . utility and industrial buyers . . . electrical contractors . . . electrical dealers . . . will find their needs anticipated by Graybar's 60,000 item service of electrical supply.

A nearby Graybar warehouse speeds up delivery of electrical products to you . . . helps you save on stockkeeping . . . brings you *what* you want, *when* and *where* you want it. Experienced Graybar men are always glad to help simplify your purchasing problems.

And behind every product from Graybar stands Graybar's 70 year reputation for satisfying the customer.

IN 1869 GRAY & BARTON
70th ANNIVERSARY
GraybaR ELECTRIC COMPANY
IN 1939 GRAYBAR

OFFICES IN 83 PRINCIPAL CITIES • EXECUTIVE OFFICES, GRAYBAR BLDG., N. Y.

ELECTRICAL WEST

The Big If's of *Television*

All sorts of people are asking all sorts of questions about television and its advent. But the important question asked by the electrical industry is: "How will it affect our business." No one in the West knows. Here are the reasons

Here is the picture you see on the screen of an RCA television set. The upside-down picture is the image on the cathode tube

"WHEN can I have television in my home?" "How much will a television set cost?" "What kind of programs will I get?" "Will the pictures be better?" These are questions that the general public asks after witnessing demonstrations in the Palace of Electricity at the Golden Gate International Exposition.

More speculatively minded individuals pose such teasers as these: "What effect will television have on radio?" "Will it put the movies out of business?" And electrical dealers, distributors and power-company folk want to know "What effect is television going to have on our business? Is it going to help us make more money? Or will it be a headache?"

For television has definitely captivated public imagination and the public consensus is that 1939 will mark the corner around which practical television will come in line with the promises that have been held forth ever since 1936. Fact is that the public knows little or nothing about this new entertainment method. A corollary is that the electrical industry has a tremendous job of education on its hands.

As for the present status of television, this recent statement from the Radio Manufacturers' Assn. just about sums up the situation: "The technical developments and field tests on television have progressed to a point where the next step in the development of the art consists in rendering experimental television service to the public. This new service, which will be on an experimental and limited basis, will be an addition to regular radio broadcast service and can only be accomplished through the installation and operation of television transmitters and the sales of television receivers."

An RCA man at the exposition poses for a telecast under a bank of high-intensity lights. Ordinarily, very elaborate makeup is used on all actors

OBVIOUSLY this statement requires elaboration. If technically television is already an achievement, then there are physical, geographical and economic limitations which represent hurdles of no small magnitude before any representative segment of the public will be enjoying regular broadcasts. In all likelihood the only market for television receivers and the only localities that will have regular television broadcasting in 1939 are New York and Los Angeles. The reasons for this involve the limitations previously mentioned.

THE physical and geographical restraints on television are serious. Transmission of television signals is limited by the height of the antenna and the character of the surrounding terrain. Fifty miles is the operating limit for an antenna a quarter of a mile high, except under extremely favorable conditions. A 400-ft. antenna will send adequate signals a maximum of 25 to 30 mi. Use of ultra-short waves limits transmitting range. These waves, unlike longer ones, do not follow the earth's curvature; they pursue a straight line, strike the earth's surface and bounce off into space. Their limit is the horizon, or as the experts say, "as far as the eye can see." Intervening obstructions will blot out reception from certain sections. They also will cause signal reflections which complicate reception.

Thus the higher the antenna is located, the wider the area that may be covered and the better the signal. For instance, a possible location for a send-

ing station in the San Francisco Bay area would be the high hill back of South San Francisco. This has the further advantage of being near the center of population for the area to be served. Portland Heights might serve in Portland; one of the higher hills would do in the Los Angeles metropolitan area. An antenna on the roof of the tallest building would have to serve in Sacramento or Fresno.

This particular limitation, coupled with economic considerations, definitely restricts the possible location of television broadcasting stations to metropolitan areas of 100,000 population or more. Hence it is obvious that there are many sections of the West that will be without television until such a time as costs are drastically reduced or technical developments solve some of the broadcasting limitations.

ANOTHER difficulty is that television stations cannot be hooked up in networks like sound broadcasting stations. Ordinary telephone circuits distort television signals beyond recognition. Coaxial cable such as that developed by A. T. & T. will transmit television signals, but its initial cost and its potential value for ordinary telephone work rule it out for the present. Relays of special radio transmitters at 25-mi. intervals have been suggested, but this system is not in existence today nor does it appear economically feasible.

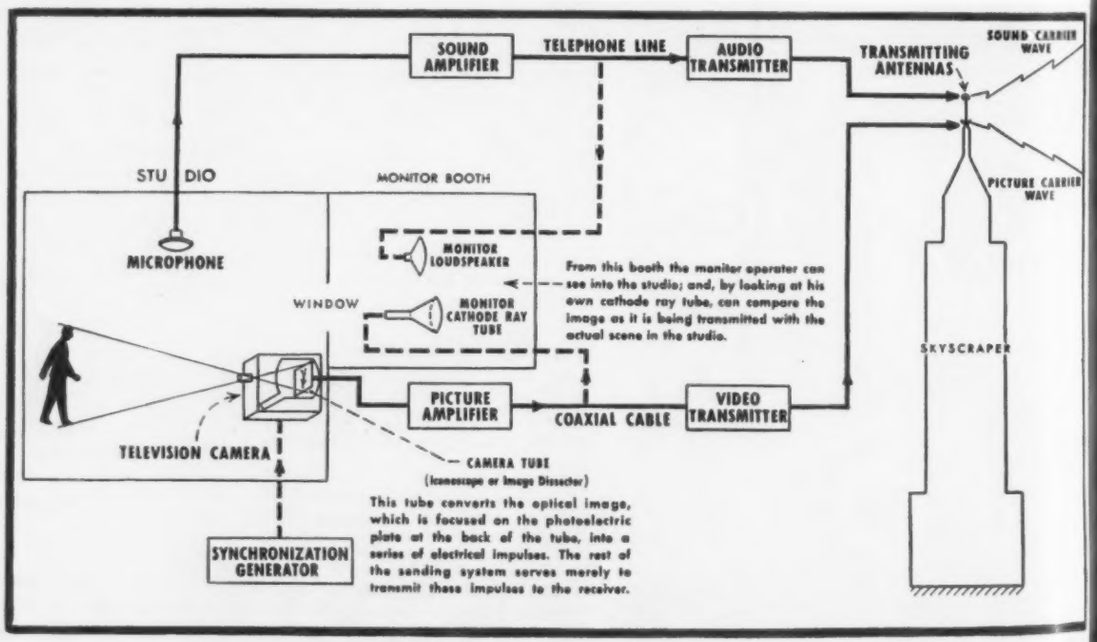
Thus each television station must rely upon its own resources for programs, or it must use motion picture film. Programs will have to be devised, cast, rehearsed and produced individually by each station with a concomitant enormous increase in costs over present-day radio broadcasting.

A restriction which may eventually prove serious is that the present number of stations which can operate in any given 100-mi. area is limited to seven. This is the number of channel assignments now considered technically feasible. The band required for complete television transmission is 6,000 kc. as contrasted with the entire sound broadcasting band of 1,050 kc. between 550 and 1,600 kc. The Federal Communications Commission's rules set up seven channels, each 6,000 kc. wide in the ultra-short wave band, starting at 50,000 kc. and ending at 108,000 kc. Television engineers consider the lower frequency channels the most desirable, although transmitters and sets are built to operate throughout the entire range.

Reasons for some of these limitations develop when one considers the intricacy of pictorial reproduction and the method used to accomplish this in the case of television. A printed picture (halftone) consists of a series of dots which reproduce the areas of light and shade. These range from 3,000 to 15,000 per sq. in., depending upon the screen used. A television picture corresponds roughly to a 60-line newspaper screen (ELECTRICAL WEST uses a 100-line screen for its engravings). Such a newspaper engraving 9 by 7 in. would have 200,000 individual dots. In television each of these must be transferred into an electrical impulse and sent out over the transmission system. In a television system the problem is to transmit a sufficient number of complete individual pictures per second to give the illusion of motion just as in the case of movies. This rate is 30 per sec. Thus the 200,000-dot picture reproduced 30 times per sec. becomes 6,000,000 electrical impulses per sec. Such speed requirements constitute the reasons for ultra-short wave lengths and extraordinary circuits.

HOW this is accomplished in a television system is shown in the accompanying pictorial diagram. The iconoscope or image dissector is a phototube, the basis of which is a mica sheet on which infinitesimal dots of silver are deposited. Light focused on these dots produces a positive charge which is proportional to the light intensity. These positive charges are removed from the plate by an electron beam which scans the plate horizontally just as the eye scans printed lines of type. Travel of the beam from left to right and up and down over the plate is controlled by magnetic fields. The electrical charges with their fine variations in shading are carried by the beam in the form of impulses which are impressed on the transmitting system. These are radiated on the ultra-short wave carrier from the antenna.

The receiver reverses this process. The signal is picked up by the receiving antenna, amplified by the receiver and then passed into a detector tube which restores it to the form in which it left the image dissector. A cathode-ray tube is the "brain" of the receiver. In it a source of electrons is sprayed onto a fluorescent surface which reproduces the picture. The stream of electrons produces a spot of light, the in-


SOUND AMPLIFIER
TELEPHONE LINE
AUDIO TRANSMITTER
TRANSMITTING ANTENNAS
SOUND CARRIER WAVE
STUDIO
MONITOR BOOTH
MICROPHONE
MONITOR LOUDSPEAKER
From this booth the monitor operator can see into the studio; and, by looking at his own cathode ray tube, can compare the image as it is being transmitted with the actual scene in the studio.
WINDOW
MONITOR CATHODE RAY TUBE
PICTURE CARRIER WAVE
SKYSCRAPER
PICTURE AMPLIFIER
COAXIAL CABLE
VIDEO TRANSMITTER
TELEVISION CAMERA
CAMERA TUBE
(Iconoscope or Image Dissector)
This tube converts the optical image, which is focused on the photoelectric plate at the back of the tube, into a series of electrical impulses. The rest of the sending system serves merely to transmit these impulses to the receiver.
SYNCHRONIZATION GENERATOR

Pictorial diagram explaining (left) the transmission of a television program and (right, on opposite page) the reception of a program. Diagram through courtesy of Business Week

PRINT IN BINDING

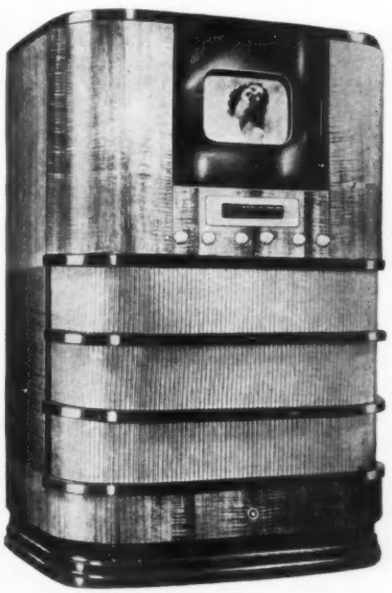
tensity and movement of which is controlled by the picture impulse signal in absolute synchronization with the electron beam in the camera at the sending end.

In producing a single image in 1/30th of a second, the beam moves across the screen at the rate of 2½ mi. per sec. and changes intensity every 1/50th of an inch. The image contains about 400 horizontal lines.

THE sound accompanying the picture is produced from its own transmitter in perfect synchronization with the action. It is picked up by a conventional receiver chassis which has its circuits so arranged that one dial (or push button) controls both picture and sound. As contrasted with the station selection, volume and tone control on an ordinary radio, a television set has these and several more. On the new G-E sets, front controls include brightness, contrast, focus and tuning and rear controls include horizontal and vertical size, hold, centering and distribution. High voltage is one of the requirements of the cathode-ray tube. From 1,500 to 7,000 volts is used to operate this tube, depending upon its size.

Number of tubes varies with the design. A simple television set arranged for vision only will have 17 tubes. An all-wave radio and television receiver will have as many as 30 or 32. At present, cathode-ray tubes are available in 3½, 5, 9, 12 and 14-in. diameters. The smallest tube produces a 2½-in. wide picture while the 12-in. tube will produce an 8 by 10. Prices range from $25 for the 5-in. tube to $95 for the 12-in. one. Popularity of television and increased production should bring these prices down eventually. However, one advantage is that the tube has a reasonably long life—1,000 hours or more.

If all the technical limitations outlined above loom large, then the economic ones are equally great. Cost is a big item in television, whether one be discussing transmitters, receivers or programs. RCA has announced a line of transmitters, the smallest one of which is priced at $60,000 excluding installation, studio construction and cost of a site. A complete station using one of these transmitters might conceivably cost $150,000 complete, depending upon the installation difficulties. The transmitter for a major station might be priced as high as $500,000 with another $150,000 for installation.



One of General Electric's receivers

Set prices range from $100 for a vision-only set up to $1,000 for a combined all-wave and television receiver. A "build-your-own" kit may cost less. The new G-E line just announced has an approximate price range of from $250 to $1,000.

IN all probability nine manufacturers will have sets on the market this year. The list includes American Television Corp., F.A.D. Andrea Radio Corp., Allen B. DuMont Laboratories, Garod Radio Corp., General Electric Co., Philco Radio & Television Corp., Pilot Radio Corp., RCA Manufacturing Co. and Zenith Radio Corp. Cathode-ray tubes are made by DuMont, General Electric, Hygrade-Sylvania Corp., National Union Radio Corp., RCA and Western Electric.

Insofar as the Pacific Coast is concerned, there is only one regular television broadcasting station in operation at present, the Don Lee Broadcasting System station W6XAO at Los Angeles. This system also has an application pending for a station at San Francisco, and the May Co. has applied for a license for Los Angeles.

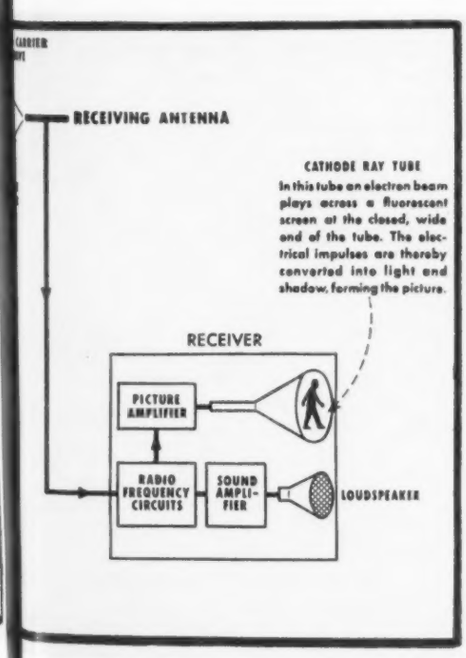
W6XAO transmits telecasts six days a week. These include live-talent transmissions of plays, vocalists and speakers, as well as film subjects. The telecasts, which are an hour long, are presented every week-day night and at noon on Wednesdays.

As for the balance of the country, regular programmed television was to have started in New York coincident with the opening of the New York Fair April 30. The 23 experimental licenses either granted or pending before the FCC cover the following cities besides Los Angeles, San Francisco and New York: Boston, Philadelphia, Camden, N. J., Kansas City, Iowa City, Chicago, Albany, Bridgeport, Schenectady and Milwaukee. In addition, the National Broadcasting Co., RCA and Philco have licenses for portable mobile sending equipment.

All the existing licenses are issued by the FCC on an experimental basis. The sale of broadcast time for any purpose is prohibited. This raises the question as to "Who is going to pay for programs?" For the present, the broadcasting stations must carry the cost. And these costs may be large, unless the programs consist largely of films. "Live" programs can and will run into money. *Business Week* reports that television in England has cost the British Broadcasting Co. $2,750 per hour for one hour a day over a period of a year.

Because of the inability to "pipe" programs from one station to another, films seem to offer one solution to the program problem. Already tie-ups between some of the movie companies and television companies are reported. Certainly techniques far different from those now employed in sound broadcasting will be necessary.

Out of the experiments now being conducted will come some idea as to the future of television. They will tell whether the public will take to television as it has to radio and whether the public will pay the prices for receivers. If the public does, then the electrical industry will have a new product and service. And the power companies will have to think about new lighting effects, because good television reception demands low lighting intensities.


RECEIVING ANTENNA
CATHODE RAY TUBE
In this tube an electron beam plays across a fluorescent screen at the closed, wide end of the tube. The electrical impulses are thereby converted into light and shadow, forming the picture.
RECEIVER
PICTURE AMPLIFIER
RADIO FREQUENCY CIRCUITS
SOUND AMPLIFIER
LOUDSPEAKER

Will Higher Load Densities Mean Higher Costs?

Viewpoints of Western engineers on building distribution for tomorrow. Four-page tabulation of Western practices and trends. A symposium edited by John Bankus, assistant chief engineer, Pepco

JOHN BANKUS

ELECTRIC service is now available to all prospective users in urban areas. Continued growth in residential, commercial and industrial loads may be expected to follow the increase in population in such areas. However, the most rapid load growth undoubtedly will result from increased use on the part of existing customers. This means higher load densities.

The situation therefore presents several problems which are of vital concern to all utilities. These problems may be briefly stated as follows:

1. What will be the effect of such load increases on the distribution system load factor?
2. How can the existing distribution systems be most economically amplified for taking care of increased loads?
3. Will the addition of the necessary distribution capacity in the required increments tend to lower or increase distribution costs?

It is extremely important that the answers to the above questions be ascertained as accurately as possible since the ability of the utilities to continue to reduce rates will be vitally affected by such costs.

The cost of distribution as here considered includes all such costs as are involved in distributing electric energy from the local substation to the customers' meters.

Certain practices at least offer an opportunity for lowering distribution costs when serving heavier load densities. On the other hand, there are other factors which very definitely tend to increase distribution costs. Some of these practices are optional with distribution engineers, while others represent trends which are entirely beyond the control of the engineers, and yet may still have an important bearing on how much money will be needed for a given unit of distribution tomorrow. What will be the net effect of all these factors on distribution cost?

Each distribution problem has individual characteristics and the solution submitted must give due weight to such local factors. However, it is equally important that distribution engineers properly appraise the value of new developments in distribution equipment as well as such practices as may serve to lower distribution costs. As examples of such developments and practices may be mentioned the following:

1. Unit substations
2. Primary networks
3. Secondary overhead networks
4. Common primary and secondary neutral
5. Static capacitors
6. Bus regulation
7. Banking distribution transformers
8. Step-voltage regulators
9. Service restorers and repeating fuses
10. Off-peak control devices
11. Standardization of material
12. Simplifying construction methods
13. Use of labor-saving devices
14. Better planning

Most of these developments and practices already have been introduced into one or more of the Pacific Coast distribution systems. However, by referring to detailed practices and trends as given on pages 24-27, for underground and overhead systems, it is rather impressive to note the differences which exist in respect to present practices.

Among the factors which are beyond the control of distribution engineers and which tend to increase distribution costs may be mentioned the following:

1. Higher taxes
2. Higher labor costs
3. Burden of government regulation
4. Higher material costs
5. Requirements for improving continuity of service
6. More exacting voltage-regulation requirements.
7. Alterations necessitated by road-widening and street-improvement programs

It is apparent that areas can be found today having load densities equivalent to those which will be characteristic of much larger areas tomorrow. It does not follow, however, that present methods of serving these represent tomorrow's most economic practice. The methods of serving load concentrations in a community whose over-all density is moderate may not prevail when the over-all density becomes as great as that which now represents a concentration. Furthermore, the factors already mentioned, some of which apply regardless of density, will be at work.

How prominent distribution engineers view these problems is told on the following pages. The summaries of contemporary practices of Western systems—in distributing to urban loads—are an endeavor to report the usual rather than the extreme. The cooperation of the chief engineers of Western utilities made possible this compilation.

Emphasis has been given to situations in which contemporary practice for a given system is undergoing change. Such a summary may have the value of presenting to the individual engineer a cross-section of Western viewpoints, to which he can relate his own problem of improving the economy and efficiency of his own particular distribution plant.

Today's Trends

In practice and equipment, as they affect costs

By S. J. LISBERGER
Pacific Gas and Electric Co.

CONFRONTED with increasing load densities, with changing characteristics, and the pressure for lowered costs, the distribution engineer finds himself speculating on the answers to several vital questions. The editor has posed some of these to the writer for his comments. In answering them he hopes that he will stimulate some degree of introspection on the part of others to the end that the customer may continue to be served economically and reliably.

1. As urban load densities rise, will the distribution cost per kw. rise or fall?

To answer this question properly, "urban district" should be defined, or better, be divided into several types of areas, such as: (a) new tract developments in a given urban territory, (b) residential or semi-commercial areas not in the most congested section of a metropolitan community, and (c) congested downtown areas in a metropolitan territory.

If, in a given residential area, the same type of load growth and supply construction are to continue, the capital cost of distribution facilities should decrease with an increase of load. However, should local improvements and ordinances require a change to underground as the district builds up, then of course distribution costs can be expected to increase materially. When new real estate developments are taking place, the tract owners frequently plan the development for an underground supply; the distribution facilities are often located on the rear lot lines.

Street lighting service must be supplied over different routes. The type of supply facilities materially affects the distribution cost per kw. As there may be many of these new tracts opening up in widely separated parts of an urban community, it takes some time before each area is built up to the density that prevails in the older territory. The load of the urban area as a whole will have increased, but the density per mile of street served will decrease until the territory has been well developed. Hence, if the load in the older territory does not increase in proportion to that taken on in the newer areas the distribution cost per kw. will increase for a certain length of time, following which it should decrease.

The costs will be affected in part by the character of the new development as well as the type of rebuilding that may take place in a previously built-up area, such as the construction of apartment houses or flats which replace single-family dwellings. The consequent greater land occupancy may materially increase the load density; if service has been previously given by means of overhead supply lines and if this can be continued, then the costs of distribution will fall over a period of years.

In the heavily loaded downtown area, where underground facilities are already installed, the costs occasioned by an increase in load density will depend upon the percentage increase and the area over which it is spread. If in a metropolitan area a general increase of load takes place over an area that is not too widespread, it is most probable that a change in the system of supply may be found necessary, particularly if the existing primary system is "radial." The quality of service that must be given in these congested areas is different from that existing in a residential or semi-commercial zone. With the widespread use of electric power so vital to the operation of large buildings, stores, etc. interruption to service seriously inconveniences this type of customer. The lack of flexibility and quick restoration of service in a radial system will probably force a change in the system to "secondary network."

As this type of supply facility requires, for economic supply, a minimum of probably three primary feeders with their complement of substation switches, vault transformers, and network protectors, the first step in the establishment of such a system is necessarily high, but as the system is extended and more load added thereto, the cost per kw. will decrease with an increase in load, and over a period of years the distribution costs of taking care of increased load will decrease.

In answering the above question, both for residential and business areas, the cost depends on the area involved, the density of the existing load, and what normally can be expected in increased demands for service.

2. How should the distribution engineer adjust his outlook and practice in the light of today's trends?

The distribution engineer must make a careful analysis of the problem at hand and must not be averse to changing his ideas regarding past practice. He should not neglect the factors of rising costs of labor and material since these items materially affect the cost of the facilities that must be installed. He must plan a system which has a reasonable degree of flexibility in order that increases in load can be supplied by orderly extensions without being compelled to change the plan basically when new ordinary loads and those of more than the usual order must be served.

3. What part can modern equipment and practice play in cost reduction?

Consideration should be given to modern trends and practices in the utilization of equipment to attain efficiency, economy, and reliability. Some personal observations follow:

The step-type regulator has proven quite satisfactory for feeder regulation in urban service. It offers some saving in cost over the induction type. If the territory is such that three-phase step regulators can be used as compared to single-phase induction types, the step-type offers material advantages for real savings.

It is doubtful if service restorers, repeating fuses, etc. will be found advantageous in urban areas. Too often these devices require more attention and maintenance than their use justifies. Past practice has shown that on distribution systems which are well designed and constructed, and where care has been given to the selection of reliable types of fuses, cutouts, etc., a high standard of service can be rendered.

The justification for the use of capacitors will depend upon the power factor of each circuit. Capacitors have been used most satisfactorily in certain residential areas in the East where a large number of fans and similar equipment in use on a system cause low power factor.

The "primary network" has not found general use in urban systems. The application of such a system depends largely upon the present density, the growth of load, and the geographical and physical layout of the system. As this system requires a large number of step-down substations and the extension of high-voltage supply lines to each substation, the area in which these substations must be located and the streets over which the high-voltage lines must be extended play vital parts in the economic solution. Studies have been made in several areas for such a network but in no case has it been justified on the system with which the writer is affiliated.

Overhead secondary networks have been used to some extent in the East. The application of such systems has not been found either economical or advisable as yet in any part of our territory.

Common neutral for primary and secondary in overhead systems has proven to be economical in certain areas. It is doubtful that in an existing

(Continued on page 28)

Table I—Twelve-System Survey of Urban, A. C. Underground Distribution

	Substation Switching Equipment	Primary Feeder Arrangement	Subway Type Transformers	Secondary System	Trends
Puget Sound Power & Light Co.	S.P.S.T. feeder breakers are used on largest network which is operated at 4-kv. star.	All primary feeders are radial, interleaved and feed a common secondary network through subway transformers and network protectors. Largest network operates at 2,600-4,500 volts, 3-phase star, grounded neutral. Another, smaller network at 2,400 volts, 3-phase delta. A third, spot network is at 13,800 volts, 3-phase delta. Standard main feeder cable on the original 4-kv. network was 350,000-C.M., 3-conductor. Recent additions have been 500,000-C.M., 3-conductor. Branch feeders to transformer banks are No. 2 single-conductor and No. 2, 3-conductor cables. Favor paper-insulated, lead-covered cables for primary feeders. A weather-proof neutral conductor is bonded in each manhole to all lead sheaths and in each transformer vault to a ground electrode buried underneath the floor at permanent moisture level.	With few exceptions, all transformers on 2-kv. and 4-kv. networks are single-phase. 13-kv. spot network uses 450-kva., 3-phase units. On larger banks of 700-kva. capacity on 4-kv. networks, and 450-kva. units on the 13-kv. network, no overload protection is provided except by the circuit breaker at the substation. Smaller units are protected by subway-type oil fuses or automatic circuit breakers, set at four times full-load current. Trend is toward elimination of overload protection on all but the units below 150 kva.	On the largest 4-kv. network the secondary is 240-120 volts, 3-phase, 4-wire delta. On the smaller 2-kv. networks and 13-kv. spot network, voltage is 120-208, 3-phase, 4-wire star. Power and light are served from the same mains on all networks. Standard street mains consist of four 500,000-C.M. conductors, but in heavy load density areas with 700-kva. transformer banks, these are doubled to provide 1,000,000 C.M. Lead-covered cables have been standard, but a trial installation of non-leaded has given perfect service for several years. Use network protectors exclusively on the network systems' transformer secondary leads. Heavy copper fuses are used in secondary mains leading each way from point of transformer connection. Secondary neutral is grounded to electrode buried under each transformer vault and by bonding to all lead sheaths and to primary neutral on 4-kv. systems. Common primary and secondary neutral employed on 4-kv. network.	With further load growth and extension of territory the trend will be toward extension of the 13-kv. feeder system, as the 4-kv. network has reached the limit of its capacity. There seems to be no marked advantage which would justify changing the 120-240-volt delta mains to 120-208-volt star, but the latter type will be used on new installations. **Note:** The data apply only to the networked systems in the business district of Seattle. Smaller radial underground distribution systems in residential developments, parks and commercial sections of smaller cities will require separate treatment.
Seattle City Light	S.P.S.T. feeder breakers.	Feeders are radial. 4,330 volts obtained from wye-connected station transformers feed delta-connected subway transformers. Fedeer cables are 3-conductor, 300,000-C.M. lead covered. Neutral is grounded at station only. Use ground rods and plates.	Transformers are single-phase, protected with D & W oil-fuse cutouts.	120-208-volt Y, 3-phase, 4-wire, power and light served from the same mains. Use three, 500,000-C.M. leaded and one 250,000-C.M. bare cable. Use leaded cables only. However, look with favor on 60% rubber cables. Network protector on each transformer bank. Grounded at every manhole and vault. Use rods and ground plates. No common primary and secondary neutral.	No changes contemplated.
City of Pasadena	Truck-type and metal-clad breakers.	Feeders are radial, 2,400-volt delta, 3-conductor, lead-covered and vary from 500,000-C.M. to No. 4. Favor leaded cables.	Use some 3-phase but mostly single-phase transformers, with G & W and D & W oil fuses for protection.	120-240-volt, single-phase and 240-volt, 3-phase. Cables are lead covered and vary from 2/0 to 500,000 C.M. Grounding is at transformers and at 500-ft. intervals. Do not use common primary and secondary neutrals.	No comment.
Washington Water Power Co.	T.P.S.T. feeder breakers.	System consists of two radial 13-kv. delta feeders and three loop, 4-kv. wye feeders. Both systems paralleled through 120-208-volt secondary network. 4 kv. feeders are 3-conductor, 250,000-C.M. cable. 13-kv. feeders are 3-conductor, 350,000-C.M. cable. Leaded cable preferred. Grounding is common with secondary neutral and d.c. Edison neutral which is grounded at substation only.	Transformers are single-phase. Sizes 50, 100 and 150 kva.	Secondary is 120-208 volts, three-phase, 4-wire. Light and power served from same secondaries. Secondary consists of four single-conductor, 500,000-C.M. cables, non-leaded is favored. Network protectors are used on secondaries suppled from the 13-kv. system and fuses on secondaries supplied from 4-kv. system. Common primary and secondary neutral is employed.	Future extensions to the underground system will be by the use of 13-kv. radial feeders with network protectors.
Northwestern Electric Co.	T.P.S.T. feeder breakers.	11,000-volt system is radial with duplicate service to all important distribution vaults. 2,400-volt system is radial with frequent cross-ties, equipped with switches, for interconnection of feeders in case of trouble. Switches are normally open. 11,000- and 2,400-volt feeders are both delta. Cable size of mains are principally 250,000-C.M., 3-conductor. Leaded cables are favored.	Both single and three-phase transformers are used on the 11,000 volt system; single-phase only on the 2,400-volt system. Three-phase power is obtained by banking single-phase transformers in delta or open delta. Protection for the 11,000-volt system primary is provided by overload relays and oil circuit breakers at the substation. The 2,400-volt system mains are protected by fuses.	11,000 volt distribution is 120-208-volt. 2,400 volt distribution is 120-240-volt for lighting and 208 and 240 volt for power. Part of 2,400-volt system is being cut over to 120/208-volt, 3-phase, 4-wire. On 3-phase, 4-wire system, light and power are served from the same secondaries; on 3-phase, 3-wire, separate secondaries are used. Various size single-conductor cables are used on both systems. Both leaded and non-leaded cables are in use. No one kind is applicable to all conditions. Secondary circuits of both 3 and 4-wire, 2,400-volt systems are fused at each transformer vault in the junction box. Fuse links of relatively high capacity are installed on the transformer side and smaller links on load side, both within junction box. Besides providing overload protection, these serve for disconnecting circuits for maintenance. Neutrals are grounded to buried plates at transformer vaults. Common primary and secondary neutral is not used.	The only change contemplated in the underground is the conversion of the 2,400-volt system, single-phase, three-wire secondaries to four-wire 120-208 for combined light and power.

Table I—(Underground, Continued)

	Substation Switching Equipment	Primary Feeder Arrangement	Subway Type Transformers	Secondary System	Trends
Pacific Gas & Electric Co.	T.P.S.T. feeder breakers.	Except where a secondary network is used, primary feeders are radial. But there are ties to other radials to provide emergency service. Voltage is nominal 4-kv. wye and 12-kv. wye, the latter in large urban areas only. On 4-kv., nominal feeder size is 400,000-C.M. and 500,000-C.M., 3-conductor; on the 12-kv. system, feeders are 500,000-C.M. and 250,000-C.M., depending on load density. Prefer paper-insulated to lead-covered cable. Neutral is solidly grounded.	Except for the network, all transformers are single-phase. Use G. E. Co.'s D & W oil fuse subway cutout for 4-kv. system. Use own development of fuse in oil for 11 kv.	Endeavor to deliver 120-240 volts to customer on single phase, 120-208 volts wye on network. Also supply 240-480 volts for 3-phase power. Light and power served from common mains, using single conductor in sizes from No. 4 to 500,000-C.M. Primary side of all transformers is fused, except those on network. Secondary side of all transformers fused, including network. Secondaries are solidly grounded and common primary and secondary neutral is employed.	No comment.
Portland General Electric Co.	T.P.S.T. feeder breakers.	Six 4,150-volt radial feeders; all supplied from one substation with bus regulation at substation. Feeders are 4-conductor, 350,000-C.M. and 3-conductor, 250,000-C.M. Primary mains are 1/0 single-conductor and No. 2 and No. 6 three-conductor cables. All are leaded. A.C. primary and secondary and d.c. Edison neutrals are interconnected, a.c. primary neutrals are grounded at supply substation and transformer vaults. D.C. Edison neutral is grounded at substation.	Transformers are single-phase except for a few isolated installations. Transformer sizes 75, 100, 150 and 200 kva. Transformers are protected with D & W primary cutouts.	Initial installation was 120-240-volt single-phase lighting and 240 and 480-volt power. For this, power and light used separate mains. The larger part of the system has now been changed to 3-phase, 4-wire secondary network which serves light and power from common mains. Secondary cables are 3-conductor, 500,000-C.M. and 3-conductor, 250,000-C.M. and single conductor 250,000-C.M. All cables are leaded. All cables are fused where they radiate from vault. 1,500,000-C.M. cables are used for transformer secondary connections. Common primary and secondary neutral is used.	Single-phase distribution is being changed to 3-phase, 4-wire secondary network. All new cable for secondary network is single-conductor. Where capacity of 250,000 C.M. is exceeded, duplicate 250,000-C.M. mains are installed. All 3-conductor cables in network are fused in secondary junction boxes. New vaults will be designed for three-phase transformers.
Los Angeles Bureau of Power & Light	T.P.S.T. feeder breakers.	Primary feeders are radial. 4,800-volt isolated delta. 3-conductor, 500,000-C.M. cable. All cables are lead covered. No primary neutral.	Transformers are single phase, protected by oil fuses.	Secondary voltages are 120-240, single-phase, 240, 3-phase. In some cases light and power are served from same secondaries. Cables are single-conductor, lead-covered. In sizes of 6, 4, 1/0, 4/0, 500,000-C.M., 1,000,000-C.M. and 1,500,000-C.M. Fuses only are used for secondary protection. Secondaries are grounded at the consumer's water pipe. Common primary and secondary neutral is not used.	The foregoing is standard practice and no changes are contemplated.
Southern California Edison Co.	T.P.S.T. feeder breakers.	Most feeders are radial. One network. Primary voltages are 4-kv. wye and 11-kv. delta. Feeder cables are 3-conductor, 4/0 and 350,000 C.M. Favor leaded cables. Primary neutral consists of a bare wire under duct lines bonded to sheath and grounded to rods in vaults.	Use both single- and three-phase transformers, protected with oil cutouts.	The radial secondary is 120-240-volt, single-phase and 240-volt, 3-phase. The network is 120-208 volts. The radial system uses two 500,000-C.M. cables for single phase and three 4/0 cables for 3-phase. The 3-phase, 4-wire network uses two sets of mains of 250,000 C.M. Leaded cables are preferred. Primary fuses are used for radial system and network protectors are used for network.	No changes contemplated.
San Diego Cons. Gas & Elec. Co	T.P.S.T. feeder breakers.	Feeders are radial, 4-kv. wye. The primary feeder consists of three 4/0 and one 1/0 neutral. Favor leaded cables. Primary neutral is grounded at all available points at station including water pipes, etc. Ground rods about every 1,000 ft. on line and at individual transformer stations.	Transformers are single-phase, protected with oil fuse cutouts.	115-230-volt, 3-wire for lighting; 230-volt, 3-wire for 3-phase power; 230-volt, 1-phase for small power motors. Secondary cables consist of 2, 3 or 4 conductors, depending on service. Prefer leaded cables. Fuses are installed at entrance boxes. No network protectors are used. Neutral is grounded to water pipes or other convenient structures. Do not use common primary and secondary neutral.	No immediate changes contemplated. In the future some form of network is likely to be required.
Public Service Co. of Colorado	All 13-kv. feeders for network are equipped with T.P.S.T. breakers. S.P.S.T. breakers are used for 4-kv. wye, 3-phase radial feeders.	Three 13-kv. delta, radial feeds for a.c. network. Main feeders are 3-conductor, 350 000-C.M. and laterals are 3-conductor No. 1. Leaded cable is used throughout. The 13-kv. system is delta, ungrounded. The 4 kv., 4-wire wye, radial system uses the following conductors: one No. 6, 5-kv. Trenchlay; four No. 4, 4.5-kv. Parkway; one No. 6, 5-kv. Okolite; four No. 2, 5-kv. PILC. Non-leaded cable has been used exclusively on all new installations since 1931. Primary neutrals are grounded only at substations.	Transformers are single-phase line type and 3-phase subway type. Transformers are protected by fuses mounted in vaults and on terminal poles.	**Fed by 13 kv. Delta Feeders** 120-208-volt, 3-phase, 4-wire, power and light served from same secondaries. Single-conductor, 250,000-C.M. in 6, 9 and 12-cond. circuits with a No. 4/0 bare neutral. Leaded cable used entirely in fibre and steel-conduit ducts. Inverse time delay fuses at service terminals are coordinated with fused network protectors. Neutrals are grounded to rods at transformers and to water pipes at metering points on customer's premises. No common neutral. **Fed by 4 kv. Wye Feeders** 115-199 volts, 3-phase, 4-wire and 115-230 volts, 1-phase, 3-wire. Power and light served from the same secondaries. 1-C No. 1 in 4 cond. circuits 1-C No. 2 in 4 cond. circuits 1-C No. 4 in 4 cond. circuits 4-C No. 1 in 4 cond. circuits Non-leaded and parkway cables are buried directly or run in duct lines. Junction fuses are used between transformers supplying secondary distribution.	Future 4-kv. extensions are likely to be made with non-leaded cable. Plans are underway to change several feeders supplying 4-kv. underground areas to a common primary and secondary neutral system.

Table I—(Underground, Continued)

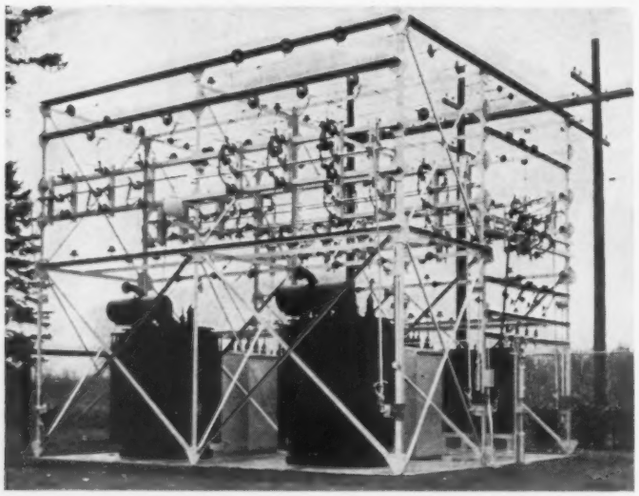
	Substation Switching Equipment	Primary Feeder Arrangement	Subway Type Transformers	Secondary System	Trends
Utah Power & Light Co.	T.P.S.T. breakers.	Both radial and loop feeder system, 4,000-volt wye. Cable sizes vary from No. 2 to 500,000 C.M., usually 3-conductor, leaded. Neutral is bare, grounded to water piping and to grounded network connected to substation.	Transformers are single-phase, automatic OCB's being used in larger substations, fuse protection only in smaller.	Secondary is single-phase, 120-240-volt 3-wire, and 3-phase, 240-volt 3-wire. Most power and lighting secondaries are separate. Cables vary from No. 2 to 500,000 and 1,000,000 C.M., usually 3-conductor. Leaded cables used. A few secondary network protectors. Ordinarily, fuse protection only. Neutral is grounded to water pipes and to grounded network, separate copper for primary and secondary.	Probably will establish common primary and secondary neutral and employ 3-phase 4-wire secondary for lighting and power. More extensive use of secondary network protectors and of control permitting remote operation of primary OCB's in vaults from central substation.

Table II—Twelve-System Survey, Urban A.C. Overhead Distribution

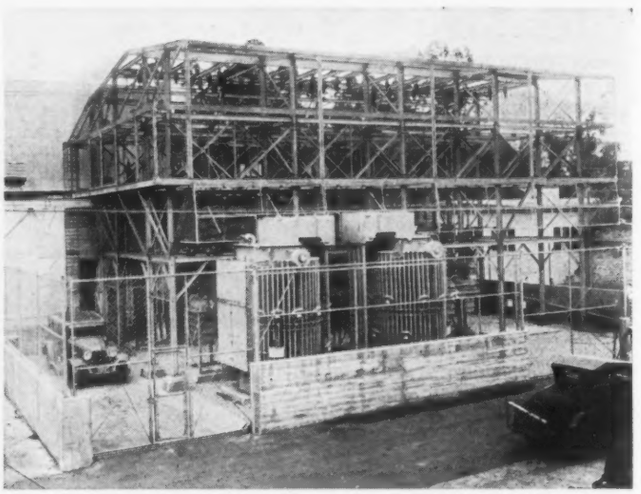
	Substation Switching Equipment	Primary Feeder Arrangement	Distribution Transformers	Secondary System	Trends
Puget Sound Power & Light	S.P.S.T. breakers are used for single-phase primary feeders on 4-kv. star system. T.P.S.T. breakers are used for 3-phase feeders on both 4-kv. and 2-kv. systems.	Primary feeders are radial. Recent standard practice is 2,400-4,150-volt, 3-phase star, but a number of older systems are still operated at 2,300 volts 3-phase delta. Standard 4-kv. feeder in larger cities is 4/0 one-conductor for each phase wire and a neutral conductor which may be common to several feeders. In smaller cities, 2/0 is used. Usually, No. 4 conductors, one for each phase wire, are used on primary mains or branch feeders. On 4-kv. systems, primary neutral is grounded and bonded to secondary neutral at each transformer installation except that the ground connection may be omitted where there is more than one transformer in the same block. No ground on primary feeder between substation and feeding point where it taps primary mains.	Standard practice calls for banking of all transformers on primary and secondary side of each feeder. There is some deviation in smaller cities and lightly loaded areas. No lightning arresters are used. On 4 kv. systems in the larger cities, single-phase primary mains are connected in a grid over the entire feeder area.	Have not used overhead secondary networks if this refers to a network system employing network protectors at point of transformer connection. The secondary mains are grid connected over the entire load area of each feeder and all transformers connected solidly thereto, with fuse on primary side only. Standard size of street mains is No. 4 copper except in heavily loaded commercial areas where No. 2 and larger are sometimes used. All urban wires are insulated. Secondary neutral is grounded to ground rod at the base of each transformer pole and in cities where permitted is bonded to water mains. Common neutral is used for primary and secondary on 4-kv. system.	Toward changing 2,300-volt delta primary systems to 4-kv. star systems with common grounded neutral. An exception is in strictly industrial sections of larger cities where it is sometimes found desirable to retain 2,300-volt delta on account of the prevalence of customers' motors wound for this voltage.
Seattle City Light	T.P.S.T. breakers on 3-phase wye feeders. D.P.S.T. breakers on single-phase feeders.	Primary feeders are radial; 4,160 volts on 3-phase wye feeder; 2,400 volts on single-phase feeders. Four No. 4/0 conductors on 3-phase wye feeders; two No. 4/0 conductors on single-phase feeders. Primary mains range from Nos. 6 to 2/0 with 2 wires on single-phase. Station grounds only for 3-phase wye feeders. Different station grounds are not interconnected. Ungrounded on single-phase feeders.	Transformers are banked for both light and power. Lightning arresters are not used. Primary grids are used.	Use overhead networks. Secondary wires range from Nos. 6 to 4/0 in size and from two to four in number. All have weatherproof insulation. Do not use secondary racks. **Grounding:** (1) 3-wire 120-240-volt single-phase lighting transformers: middle point grounded to secondary grounded neutral wire. (2) 3-phase 240-volt transformers: middle point of one transformer grounded to secondary grounded neutral wire. (3) 2-phase 240 volt transformers: middle point of both transformers grounded to secondary grounded neutral wire. (4) 3-phase 480-volt transformers: not grounded. **Note:** Common secondary neutral ground wire has standard grounds, about every 5th span, of copper coils placed in the pole hole, when pole is set, on a driven ground rod. The grounded conductor is No. 4 B & S.	Change 2,400-volt, single-phase primary feeders to 4,160-volt, 3-phase wye feeders.
Washington Water Power Co.	T.P.S.T. Feeder breakers.	Radial system is used, at the following voltages: 2,300 delta, 4,000 wye and 13,200 wye. Primary circuits are 3- and 4-conductor, No. 1/0. Mains consist of two conductors, No. 6. Neutral is grounded to water mains and driven ground rods.	Distribution transformers are not banked. Lightning arresters are not used. Primary grids are not used.	Secondary networks are not used. Circuits consist of sizes from No. 6 to No. 2 copper. Circuits consist of bare wire. Racks are not used. Grounding is obtained through the neutral which forms a grid and is grounded to water pipes and driven grounds.	The number of 13-kv. wye system will increase. Use of common primary and secondary neutral will be extended in both 4,000-volt and 13 kv.-wye systems.
Southern California Edison Co.	T.P.S.T. Feeder breakers.	Feeders are radial, 4-kv. wye. Use four No. 2/0 wires for feeders, four No. 4 for mains. Neutral is connected to ground rods, two rods per ground.	Transformer secondaries are not banked. Lightning arresters are used only to protect potheads. Do not use primary grids.	No overhead secondary network. Use three No. 4 conductors, not insulated. No extensive use of secondary racks. Secondary neutrals are connected to ground rods, two rods per ground.	No changes contemplated.

Table II—(Overhead, Concluded)

	Substation Switching Equipment	Primary Feeder Arrangement	Distribution Transformers	Secondary System	Trends
Portland General Electric Co.	T.P.S.T. Feeder breakers.	System is radial with all phase wires carried to a distribution center. In Portland, nearly all feeders are 4,150-volt wye, in other cities, 2,400-volt delta. Main feeders are Nos. 2/0 and 4/0 copper. Primary mains are mostly No. 4. Common primary and secondary neutral is used for all Portland 4,150-volt primaries except feeders out of first substation changed to 4,150-volt operation, where neutral is grounded at substation only. Elsewhere common neutral is used with multiple grounds.	Usual practice is to bank transformer secondaries. Lightning arresters are not used. Primary grids are not used.	Do not use overhead secondary network. Conductors are mostly No. 4 copper. All secondary wires are insulated. Do not use many secondary racks. Water mains are used for grounding where available. Elsewhere use ⅝-in. by 8-ft. copperweld ground rods.	Expect to use primary networks. Also for one installation may use overhead secondary network.
Los Angeles Bureau of Power & Lt.	T.P.S.T. Feeder breakers.	Feeders are radial, 4,800-volt isolated delta, all 3-wire 4/0. Branch primaries are 3-wire and 2-wire in sizes from Nos. 1/0 to 6.	Transformer secondaries are not banked. Lightning arresters are not used on transformers. Primary grids are not used.	Secondary networks are not used. Wires are Nos. 4 and 1/0, all insulated. Secondary racks are not used. System is grounded on water system and by means of driven grounds.	The foregoing is standard practice and no changes are contemplated.
San Diego Cons. Gas & Elec. Co.	T.P.S.T. Feeder breakers.	Feeders are radial, 4-kv. wye. Use three No. 4/0 and one 2/0 or 1/0 (neutral) for feeder wires. Neutral is grounded to station ground, water pipes, etc., at station and to ground rods about every 1,000 ft. along the line.	Do not bank transformers. Lightning arresters are not used. Do not use primary grids.	Do not use overhead secondary networks. All wires are insulated. Secondary racks are not used extensively. Ground to water pipes or to ground rods. Number of grounds is in accordance with GO 64 and ordinances.	No changes contemplated.
Public Service Co of Colorado	S.P.S.T. breakers on 4-kv. wye feeders of single-phase main type. T.P.S.T. breakers on 4-kv. wye feeders of 3-phase main type.	Feeders are radial, 4-kv. wye. Use four No. 4/0 conductors for feeder wires with neutral common to other feeders where possible. Both single-phase 2-wire and 3-phase 4-wire mains are used. Wire sizes in mains vary from Nos. 6 to 2/0. Primary neutral of conventional wye feeders is grounded at substation only, to water main if available; otherwise to driven grounds. Gradually being converted to common neutral.	Transformers are banked through line secondary fuses. Lightning arresters are used. Primary grids are not used.	Do not use overhead secondary networks. Wires are generally three No. 4. Insulation is twisted braid, weatherproof. Secondary racks are not used extensively. Neutral is connected to driven grounds and to water system at customers' premises.	All 4 kv. feeders are gradually being adapted to the common neutral system. Tendency toward 3-pole breakers and 3-phase tripping on single pole breakers.
Pacific Gas and Elec. Co.	T.P.S.T. feeder breakers.	Primary feeders are radial, 4-kv. wye and 12-kv. wye, usually 250,000 C.M. with neutral solidly grounded.	Do not use lightning arresters or primary grids. Transformers are banked.	No overhead secondary network. Wires vary from Nos. 4/0 to 4, all insulated. Do not use secondary racks. Neutral is solidly grounded.	None reported.
City of Pasadena	Truck-type and metal-clad breakers.	Feeders are radial, 2,400-volt delta. Use three No. 4 conductors for main feeder.	Do not bank transformers or use primary grids. Lightning arresters used.	No overhead secondary network. All wires are insulated. Do not use racks. Neutral is grounded at transformer and at 500-ft. intervals.	None reported.
Utah Power & light Co.	T.P.S.T. feeder breakers.	Feeders are radial, 4,000-volt wye. Conductors range in size from Nos. 1 to 4, 4-wire. Neutral is grounded to water pipes and to driven ground rods.	Do not bank transformers, or use primary grids. Lightning arresters used.	No overhead secondary network. Conductor varies from No. 4 to 250,000 C.M., usually 3-wire. Tendency for several years to use bare copper conductor. Racks used on newer work. Neutral grounded to driven rods and water pipes, and to water pipes on customers' premises.	None, except as noted.
Northwestern Electric Co.	T.P.S.T. Feeder breakers.	Radial system is used with sectionalizing switches between feeders. Voltages are 11,000 delta and 2,400 delta. The first serves large power customers and for sub transmission. The 2,400-volt feeders are 3-phase 3-wire and mostly No. 4/0 copper. Also some Nos. 4, 1/0 and 2/0.	Transformer secondaries are banked but limited to a maximum of 5 per bank. Lightning arresters are not used. Primary grids are not used.	Networking is limited to banking five distribution transformers. Wire size is mostly No. 4, with some Nos. 2 and 1 for heavy loaded areas. Within Portland, secondary conductors are insulated. Adjacent to city limits, some bare secondary wire is used. Little rack construction used. Neutrals of all lighting transformers and wye-connected power banks are grounded, a ¾-in. galvanized iron pipe, pointed on end and from 8 to 10 ft. long for ground rod. No. 6 copper wire, soldered to the rod just above ground line, connects the transformer neutral. Transformer cases are not grounded.	Only change in practices outlined might be conversion of 2,400-volt delta feeders to 4,150-volt wye with common neutral system. This might be considered when present feeders become loaded.



PEPCO'S NORTHERN SUBSTATION, conventional outdoor unit type, supplies two 4,150-volt feeders from 11-kv. supply. Equipment includes two 1,500-kva., 3-phase, 11,000/2,400-4,150-Y-volt transformers with four 2½% full-capacity taps on high side; two 4,150-volt switch houses with protective, reclosing and metering equipments; six 200-amp., 2,400-volt single-phase 10% buck or boost induction regulators; gang disconnects



PASADENA'S MARYLAND SUBSTATION, conventional radial type, 2,400-volt, is supplied from a 17-kv. loop. The 17-kv. facilities (above) are outdoor. The open-steel frame forms a double deck with a main bus on each deck. The two 3-phase transformers each have nine 1½% taps (changing under load) for automatic bus regulation, are rated 6,000-8,000-kva. Bus tie and sectionalizing disconnects permit isolating

system which has separate neutrals a change to common neutral can economically be justified. The existence of certain peculiar physical conditions may make it economic. The advantage of a common-neutral system is confined more often to those territories where a 3-phase, 2,300-volt delta system is to be changed over to 4-kv. wye; as the existing 2,300-volt system will normally have a position for only three wires on the crossarm, the elimination of the neutral on the primary arm will quite often save considerable sums in rebuilding. However, the application of a common-neutral system must receive careful consideration because of the extra cost of grounding and other protective features that must be provided when the common neutral is used. A careful analysis of each location must be made before definite decision is reached.

It is common practice to bank distribution transformers. The tendency today is not to bank in such large groups as existed several years ago, but rather to bank for smaller areas where a failure in any one bank caused by a cascade of blowing fuses will confine the service interruption to a minimum section.

Some applications of "limiters" in the secondary lines are under trial.

The question of using larger units of apparatus is one of economics. The cost per kw. of transformers decreases with an increase in capacity, and similarly the fewer transformers used the less the number of fuses and auxiliary devices required. However, the cost of secondary copper increases with the distance that energy must be transmitted; thus, there is the problem of balancing the most economic size of transformer vs. the size of secondary copper. This is a complicated problem and there is no general rule that can be followed. However, it can be said that large transformers cannot be used economically unless the load to be supplied is quite close to the transformer. For the average territory the most economical solution will be for overhead lines with secondary copper varying between No. 2 and No. 4 and with transformers located at such spacings as load and voltage conditions require.

Bus Regulation

Bus regulation can be used advantageously by proper grouping of feeders, provided the areas served have the same general load—time—demand characteristics. Bus regulation is, of course, less costly than regulation of individual feeders. Each part of the system must be studied carefully before any definite plan can be employed.

Provided the load demand on a substation is sufficiently large, transformers with "tap changers under load" may be found more economical than bus regulation. The over-all principle involved is the same. Pacific Gas and Electric Co. has recently built two 8,000-kw. substations, each substation having therein two 4,000-kva. units, equipped with tap changers under load. A study of the territory was made before these units were purchased. This showed that bus regulation would be satisfactory as the territory then existed. However, since the future characteristics of the area could not be predicted, provision has been made for the installation of individual feeder regulators on half of the total feeders should the load characteristics change in the future. Should these feeder regulators become necessary it is believed that regulators of not over 5% buck or boost can be installed instead of the normal 10% type.

The tendency in metropolitan areas is constantly to increase the extension of the underground system; the removal of overhead lines is being ordered by municipal authorities along the most important traffic lanes even though the area be not of high load density. It is almost unnecessary to state that underground supply systems are much more expensive than overhead systems.

Detailed studies are absolutely necessary if low-cost distribution lines are to be built. The importance of these studies cannot be overestimated. Customers' loads change slowly but if not carefully watched, these slow, annual changes will in time produce a total addition in load that will seriously affect an entire system. Because considerable time is required to correct and provide for these changes the distribution engineer may find it necessary to spend unjustified sums in order to provide for load growth in an emergency, whereas the territory might have been more economically served if orderly planning had prevailed.

Standard materials and methods of construction assist in maintaining low costs for distribution systems and simplified methods and the use of labor-saving devices are justified and should receive careful attention. Following the hurricane in New England where great damage was done to the distribution lines, one utility noted that the use of standard materials by the affected companies would have expedited the securing of repair materials

and the restoration of service. However, the most important element in the building of a distribution system is to make an orderly plan which can be readily followed and expanded without undoing too much that has been done previously. After all, the labor content is but one part of the total cost of the system. The materials are far more costly, and if these are not properly placed and if they do not have a long use in the place where installed, the cost of the distribution system will be materially increased. The design of a distribution system may be compared somewhat to a steam plant. It matters not how efficient the operating crew may be, if the design of the plant is such that high efficiencies are not inherent, then nothing can be done to produce low-cost power.

In urban, residential, and semi-commercial areas, the major opportunity for economy in providing for future growth of load, will be found in the use of unit type substations designed for either supervisory or automatic service. By careful planning, these unit substations can be installed as the load increases in such size as the economics and load of the system require. Such installations have the decided advantage of materially reducing the capital cost as compared to large substations with their attendant real estate and buildings that must be built to a certain definite size and then await the development of load.

The unit substation has the further advantage of requiring, at least on the low-voltage side, switching equipment of much less rupturing capacity than that normally required in a large substation with large transformer capacity. Such substations can often be located so as to feed into the primary feeder distribution system without disturbing existing facilities. They afford the distribution engineer of today a ready means for increasing the capacity of a system at low cost.

In the congested areas where load densities of the order of 50,000 to 60,000 kw. per sq. mi. prevail, it is doubtful if such unit substations will be found to be satisfactory or economical over a long period of years. For such locations the secondary network appears to be the most economical solution, particularly if the network can be fed from large generating stations or large substations under conditions that will require no intermediate substations. Such a network finds its ideal application in those territories where service of the highest order must be given and where the individual loads per building or per block are large, and is generally justified in metropolitan areas only.

System Economics

Influences, both basic and new, which underly planning

By O. W. HOLDEN
Los Angeles Bureau of Power & Light

SUCH a large portion of the investment in an electric utility is centered in the distribution system, that the engineer is ever intrigued to devise methods of more economic distribution. With all respect to the value of careful planning, the whims of the consumer and the development of new energy consuming appliances easily upset any long range plans. The closer to the consumer the more difficult it becomes to prepare the distribution systems for the future. For this reason the meter and service are generally selected for immediate demand and later changed when the demand increases. The secondary and transformer can be somewhat better planned for growth, and the primaries and feeders remain fairly permanent or can be adapted to rearrangement without much loss of investment in the change.

In comparison with other parts of an electric system, the distribution cost is high not because of expensive components but because of the extent of its multiplicity. Thus carefully thought-out standards which embody unit economies become important when applied to a large system.

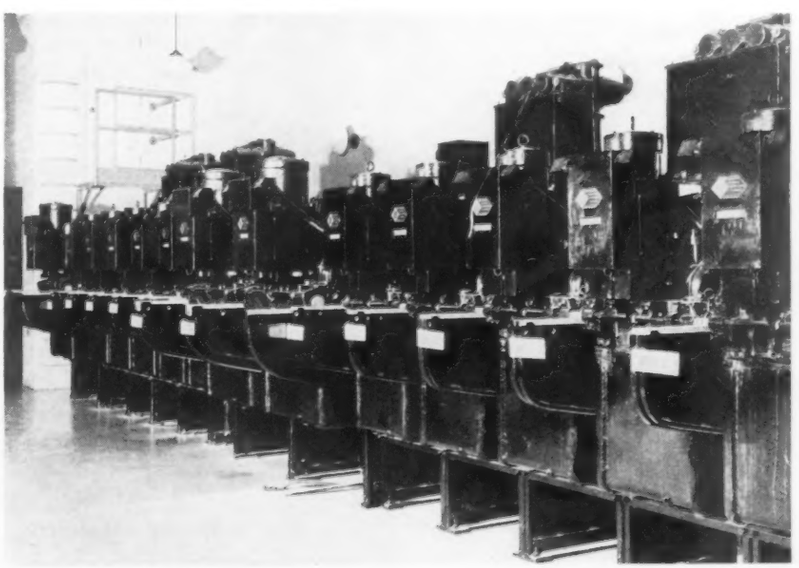
As facilities are constructed, it is the aim to utilize them to their fullest efficiency as quickly as possible. This means not only load building but also improvement of load factor and power factor to obtain the delivery of the most kilowatt-hours. Such a policy calls for cooperation between the engineering and the new business departments that the particular types of loads selected to be promoted will actually result in profitable enhancement of the system. Also undesirable loads may be discouraged.

Load-factor improvement is most desirable when attained on the consumer's service as the improvement then carries through the entire distribution system back to the station. Next desirable would be better load factors on the secondaries and transformers, gained through diversification; and less desirable but still valuable, better load factors on the primaries and feeders, also through diversification.

From the standpoint of the distribution and transmission plant and often the generating plant also, off-peak power may be regarded as a by-product, and the attack on the load factor problem can be made by soliciting off-peak loads at rates economically attractive to the consumer. Frequently the advantages of electrical over competing methods outweigh a slight cost difference, if the consumer's attention is properly directed.

With restrictions on the use of low-cost power during certain periods of the day, some method of control must be adopted. The two-rate meter puts the responsibility on the consumer but gives him uninterrupted service. Time switches definitely limit the hours of available service but require routine attention. Electrically timed switches with synchronous motors and astronomic dials are generally employed satis-

INDOOR PART of Maryland contains 2,400-volt bus and switchgear. Each transformer feeds a section of metal clad switchgear having one main breaker and five outgoing breakers. Station is under supervisory control



factorily but require manual resetting in case of power interruption. Furthermore, the switch is on the consumer's premises and subject to tampering unless protected.

A system employing high-frequency impulses superimposed on the distribution system from the local distribution station permits control of any individual feeder whenever load conditions indicate the off-peak loads should be switched. This function can be made automatic if desired. Off-peak outage can be kept to a minimum with better customer satisfaction and with possibilities for greater energy consumption.

If the future repeats the past, we can expect more appliances to take advantage of the convenience of electricity and much of this new load will come during off-peak periods. Can we picture for instance what a million automatic clothes washers, designed for daily use, might do to the mid-morning valley in the load curve?

Power factor is also largely consumer controlled, and it is on the consumer's premises that correction can most advantageously be applied. Here again, it is the utility's responsibility to influence the consumer toward power-factor correction by differential rates, or by advice as to purchasing or operating his equipment. The result may be the installation of equipment possessing a better inherent power factor or the addition of correcting apparatus. Unfortunately, no utilization equipment ordinarily installed has leading power factor, so leading and lagging power-factor loads cannot be diversified to increase the resultant power factor. Corrective equipment, whether on the consumer's or the utility's lines, is expensive and only under certain conditions does the cost justify the results. In considering the effect of improved power factor it must be remembered that power-factor regulation saves both system copper and energy.

The future may bring appliances with better or worse power factors. Inasmuch as the sales appeal is to the consumer and not to the utility it is probable that in most of such appliances, high power factor will not be striven for unless coerced by the utility. This is even now occurring in the case of the gaseous vapor lamp, which some utilities require to be corrected.

Constant vigilance for minor improvements is the objective of the distribution engineer rather than the hope of some spectacular revolution of the art. As load densities rise it is just as logical to expect lower unit costs in electrical distribution as in the manufacturing industry where mass production is now so well recognized.

Common Neutral

On distribution circuits, as employed by Northwest systems

By CORBETT McLEAN
Northwestern Electric Co.

THE use of a common neutral on distribution circuits has certain advantages and disadvantages which should be considered by the utility about to engage in this practice. In the nature of a progress report, the methods and opinions of various operating companies are listed below.

Although the original intention of the British Columbia Electric Railway Co., was to ground the neutral at as many locations as possible at the time when its first substation was cut over from 3-wire, 2,300-volt delta to 4-wire, 4,000-volt wye, its program was greatly modified on account of interference with telephone circuits. Presumably by return of neutral current through the ground system of the telephone company, the telephone bells in the vicinity of the various grounds would ring. Present practice is to ground the neutral at substations only and to tie together the neutral wires of different circuits from the same substation at outside points to form a grid. Although there are obviously undesirable characteristics in the event of a break in a neutral wire, very little trouble has been experienced in these respects.

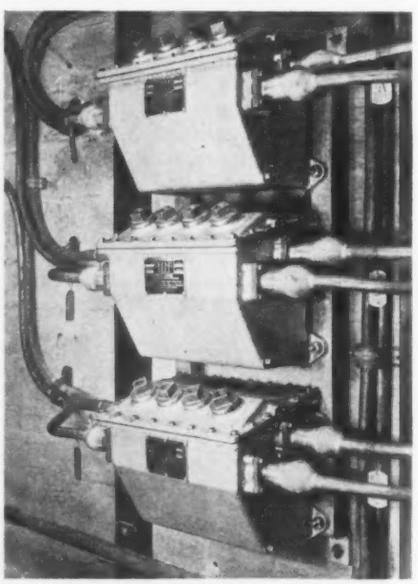
Washington Water Power Co. has been using common neutral on the distribution system for about five years, under a definite policy established after a period of experimentation, and reports that no difficulties or disadvantages have been encountered.

In the first trial—on a 4,000-volt rural line—the secondary neutral was tied to the primary neutral at each transformer bank. After development of the single-bushing transformer, the secondary and primary neutrals on many other rural lines, chiefly at 7,620 volts, were interconnected.

During the last three years, four of the smaller towns have been changed to 13-kv. wye with the common primary and secondary neutral carried on the secondary crossarm. The conversion to similar construction in three additional towns is contemplated for 1939.

In the city of Spokane, which is supplied primarily by a 4,000-volt wye, grounded-primary system, the secondary neutral grid and the primary neutral are interconnected at infrequent locations. However, it is planned to use a common neutral carried on the secondary crossarm for all extensions and rebuilds.

A ground is installed at each transformer, and, if the resistance is found to be in excess of 25 ohms, an attempt is made to reduce the resistance. On rural lines on which usually there is only one customer per transformer, a ground is installed on the customer's premises in addition to the transformer ground. On urban lines, the neutral is an inter-connected system with a ground at the majority of the customers' premises as well as the customary transformer ground. At least one ground for each 1,000 ft. of neutral is provided.



FOR RELIABILITY, Pasadena's underground uses both main and transfer feeders, the latter normally inoperative. These Howze-Judson oil cut-outs are used for transferring service

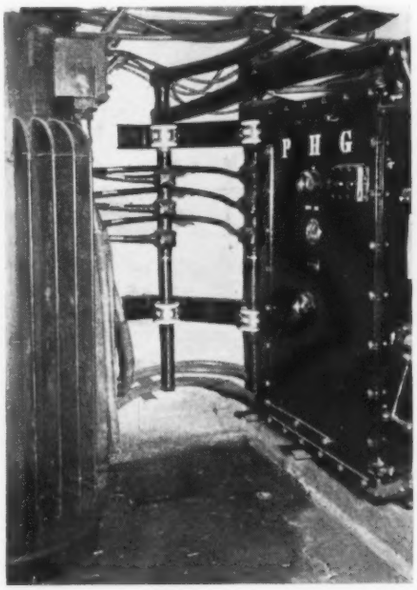
Puget Sound Power & Light Co. has made limited use of common neutral for a number of years and indicates the practice successful in economy, continuity of service, safety, and general practicability.

The common neutral grid is not isolated into feeder areas as are primaries and "hot" secondaries, but is electrically continuous throughout the system. Single-phase primary feeders are fed from 3-phase 2,300/4,000-volt, star-connected buses through single-phase voltage regulators. Primary feeder neutrals are connected to the neutral grid at primary circuit "feed points" and carry very little current under normal conditions. This arises from the fac

NORTHWEST ASSOCIATION REPORT presented at 1939 meeting of Transmission and Distribution Committee (R. J. Davidson, chairman) Engineering & Operating Section, Northwest Electric Light & Power Association

that primary neutral currents of adjacent feeder areas, the adjacent feeder areas being different in phase, cancel through the neutral grid instead of returning to substation neutral bus. Neutral feeders possibly could be dispensed with to a limited extent but are retained as a matter of extra precaution against "hot" neutrals during short-circuit conditions. The neutral grid is grounded at transformers. One ohm is typical of the order of impedance of the common-neutral ground. Grounding of service neutrals in buildings would further reduce this value but is prohibited by the Seattle wiring code.

Power loads in Seattle are supplied with three-phase 2,300/4,000-volt star



PUGET SOUND P&L employs Kerite cable on porcelain insulators for underground bus. At right is 1,600-amp. 3-pole, 250-volt network protector. 300-kva. single-phase trans. at right

DISCONNECTING POTHEAD is used on subway transformer lead. Incoming line is fireproofed. Below is 500,000-C.M. weatherproof ground bus connected to common neutral system

circuits, although some 2,300-volt delta circuits are in use as well as some few 2-phase circuits. Power primaries are not gridded. In the case of star primaries, the primary neutral is usually omitted and the common lighting neutral grid is used where necessary or desirable. This system of distribution is employed to some extent in suburban areas in King County and to a lesser extent in other city and suburban territories throughout the system.

Strict adherence to the rule that each transformer primary neutral tap shall be made to a point having one earth, and at least two metallic, returns is required. Experience has proven that the necessity for interrupting three independent circuits before the danger of a "hot" common neutral can arise is extremely sound.

It is well known that on systems such as this, "hot" secondary wires also act as neutral current conductors because lighting transformers, connected three wire, on the secondary bus act as low impedance auto-transformers. The additional neutral conductivity provided by this source is, of course, limited by circuit areas, although it substantially decreases neutral impedance to ground.

The chief advantage of the common neutral for single-phase lighting circuits is that only one primary conductor is required, resulting in lower fixed charges on investment and lower maintenance costs. Not only is one conductor eliminated but the attendant saving in number of insulators, crossarm space, fixtures, guys, et cetera, is realized.

As a result of setting network system circuit breakers to open at currents above those required to burn down a No. 4 primary, the primaries usually burn themselves clear on short circuits without service interruption. A 2-wire primary system would offer little advantage in continuity of service.

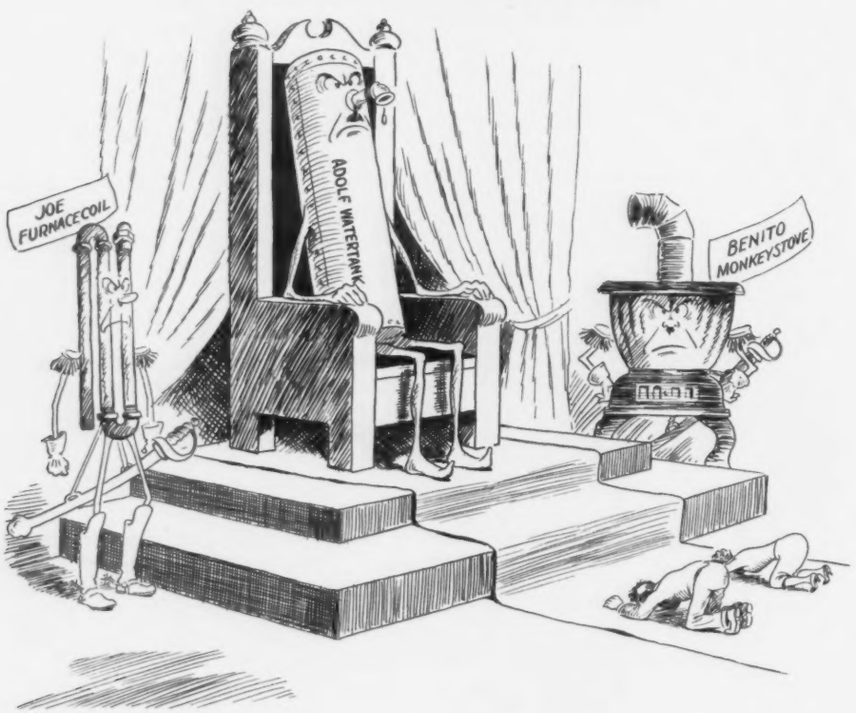
On rural lines, the common neutral has been used by this company to some extent for about three years. In general, these common neutral rural lines operate at 6,900 volts and are not gridded. They can, in some cases, be built about 15% cheaper per mile than the more usual 6,900-volt 2-wire primary lines, the exact saving varying with the amount of secondary, et cetera. Where little secondary is required, the saving is very small and the advantages of the common neutral tend to disappear.

There are certain disadvantages in the use of the common neutral line. Although the same type of insulators are generally used on 4,000-volt wye as on 2,300-volt delta circuits, a higher-voltage insulator is usually required on the 11,000-volt wye than on the 6,900-volt delta circuit. Increased insulation is, of course, not required on single-phase 6,900-volt rural lines fed from an 11,000-volt wye bus. On rural lines, telephone interference is sometimes aggravated depending upon length of parallel, balance and insulation of telephone line, trees, et cetera. When the primary is held by a pole-top pin, the neutral obstructs free raising and lowering of transformers. It is sometimes difficult if not economically impossible to provide sufficient grounds to confine "hot" neutrals within reasonable and safe limits in cases of accidental primary grounding, although no accidents have occurred from this cause. The feeding of common-neutral rural lines from 6,900-volt delta buses requires one to one ratio transformers with attendant increase in impedance as well as cost. It has been the experience of the Puget Sound Power & Light that the common neutral does not solve the problem of the demand for cheap rural lines and that its applicability and economy must be studied in each individual case.

Portland General Electric Co. followed a program of converting its 2,400-volt delta feeders to 4,150-volt wye extending over a period from 1928 to 1937. Thirteen of the sixteen substations in Portland now supply 4,150-volt wye feeders operating with common primary and secondary neutral. The advantages of increased capacity, better voltage regulation, and reduced investment per kva. have far outweighed the only difficulty encountered—that due to short circuits. The increase in current flow frequently causes primary wires to burn down not only at the point of short circuit but also at one or more locations between this point and the substation.

By proper coordination with the telephone company, no telephone troubles were experienced. The utility properly balanced the loads on 3-phase primary-circuit leads and limited the extent and load on single-phase branch leads, and the telephone company grounded some of its cable sheaths and occasionally installed high-impedance ringers. Since practically all new ringers being installed in this area are of the high-impedance type, no trouble of this sort is anticipated in the future.

BEWARE THE DICTATORS of Household Freedom



Idaho Power's campaign-starting cartoon is worth study by all

Utility Range and Water Heater Policies

DEALERS and utilities plan to sell approximately 59,000 electric ranges and 29,000 electric water heaters in the 11 Western states in 1939. How will they accomplish this sales record? ELECTRICAL WEST has made a survey of sales policies and sales plans that indicate the merchandising techniques and sales ingenuity that will be followed in various territories.

If a suspicion exists that there is a universal formula which will be applied to place these appliances in the homes of Western customers, examination of the table (see page 38) will dispel it. Encourage the salesman by the payment of bonuses, especially during campaigns, and educate the customer by means of the time-tried and proven cooking school seem to be fundamentals which apply universally. Aside from these, there is little similarity in policies.

The necessity for some type of customer inducement to purchase is recognized by about half of the reporting companies. The principal attraction is the trade-in allowance, although for every utility company that uses this inducement for stimulating its own and dealers' sales, there is one which contends that such a practice is unnecessary. There are a few territories where company and dealer have returned to the premium—either aluminum cooking utensils or oven ware. Wherever merchandising experts gather, it is possible to stir up an argument as to the effectiveness or the need for such things.

Free wiring is declining in popularity; only two companies report such a policy while a third uses the plan occasionally as a campaign inducement. Many of the companies do, however, participate to some degree in installation costs. This consists in most instances of supplying service entrance units including the main switch. This has two advantages: it permits standardization and reduces the all-around wiring cost.

Wiring costs vary with the territories. In some instances successful efforts have been made to secure a uniform cost throughout an entire region which will permit the quoting of an installed price. Most companies feel that this is desirable. As shown in the table the wiring costs range from $25 to $100. Although efforts have been started to include a 60-amp. entrance switch in ordinance requirements, this does not seem to have made much progress. Only a few regions report this requirement.

In an effort to simplify range connections, some companies have put into effect rules calling for a pigtail and plug on every range. This desirable practice may be expected to gather momentum.

Water heater policies vary over such a wide range that they will be made the subject of an extensive study in a future issue of ELECTRICAL WEST. Local requirements as to capacity, tank size, restrictions, etc., complicate the picture and indicate a crying need for standardization.

Detailed discussions for most Western territories follow. Some notable observations culled from them include the degree to which the program of the Modern Kitchen Bureau is being followed; an increasing interest in the problem of handling trade-ins; the optimism with which most sales managers view the year 1939 and the increasing degree to which the dealer is participating in both range and water heater sales.

B. C. Electric

Twenty-two major appliance salesmen who devote their full time to the sale of gas and electric ranges, water heaters and refrigerators are expected to account for 500 electric-range sales by B. C. Electric Railway Co. Dealers will sell 400.

According to plans, the company's promotion will tie in with the Modern Kitchen Bureau's range campaign. All range dealers in the territory have been supplied with a quantity of bureau pro-

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No. 5-c MAY, 1939

Electrical West

Sales Guide

Coffee Makers are Traffic Bringers

A dealer's best friend is the kind of an appliance that brings a lot of traffic into the store. Coffee makers are that kind of pal.

Every family drinks coffee at least once, many twice, others three times every day. It is already making coffee somehow. Selling electric coffee makers is therefore a 100% replacement affair.

To sell all these people the latest electrical way to make coffee is the opportunity that always knocks.

People are great for trying new methods of coffee making, just as they are forever changing brands of coffee. There is an electric coffee making device to meet any whim or fancy.

Glass coffee makers are the vogue today. Attractive and efficient, they sell fast. Natural breakage of the glassware brings a constant repeat business. When customers come back for a new bowl or some filters, often they buy other wares—lamps, flashlights, or even other new appliances. Coffee makers are traffic builders every dealer can cash in with.

Many will buy the new metal coffee makers, or percolators. Learn what their extra values are that make them worth the difference in price and in profit.

What Electric Coffee Makers mean to You

What to Say

Talk Taste, Aroma, Flavor

You have some of the most powerful allies helping you make sales—taste and flavor. Electric coffee makers give the tops in flavor. They make **better coffee.**

Your whole proposition rests on your ability to show that it is easier, more certain and more attractive to make coffee, better coffee, electrically, every time. With electric coffee makers that's a cinch.

But because **you** know it's a cinch don't jump to the conclusion that the customer does. She may think her old coffee pot is all right. She's used to it. The idea of getting used to something new worries some people more than it should and stops them from buying.

Therefore sell the taste, the flavor, increased coffee enjoyment, ease of preparation that will make buying and possibly learning a new way of making coffee well worth the investment.

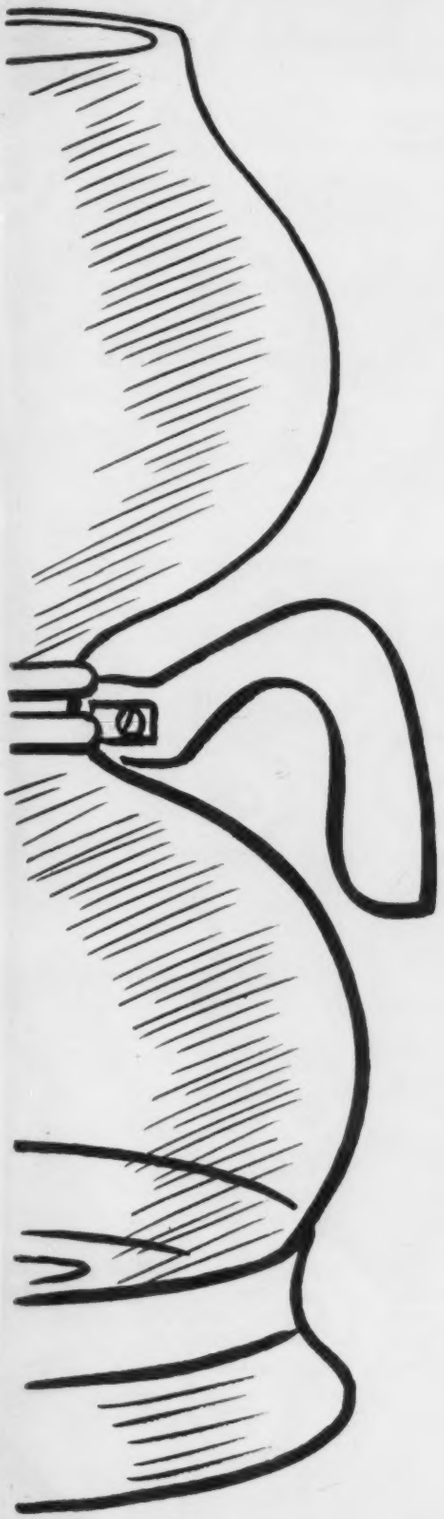
Here's where **you** come in.

To refresh your memory, these are the ad-

STAMP OF APPROVAL

Recommended by Your

THE MONTANA POWER CO. • UTAH POWER & LIGHT CO.
IDAHO POWER CO. • CALIFORNIA OREGON POWER CO.



vantages to the electric way of making coffee. Talk them.

Coffee boiled is coffee spoiled

Finer flavored, fresher tasting coffee because the electric coffee maker operates just below boiling temperature and thus never extracts strong acids that spoil flavor. Such coffee does not keep you awake.

Fine grinds for flavor—

The finer the grind, the richer the flavor. Aromatic oils that give coffee such a tempting aroma, are released into the coffee. You get this full richness of flavor.

Controlled heat means—

that coffee will be perfect each time. Full richness without a boiled taste. It also means that the coffee made can be kept warm for long periods and still retain its flavor.

Service right from the table—

Attractive and decorative, electric coffee makers enhance the table. They permit the hostess or mother to remain at the table with guests or family. Brewing coffee at the table imparts the appetizing aroma of fresh coffee to the meal.

Each make of coffee makers or percolator has its special features. If you translate these into advantages, into services and benefits the customer can obtain from a coffee maker, you give the customer more **personal** reasons for buying and you hasten the decision. You are not selling glass and metal—but superior coffee, every morning, every time. That is what the customer really wants.

to

cash in

on a popular trend

Sell

Electric Coffee Makers

Sales Allies —

PUGET SOUND POWER & LIGHT CO.
PORTLAND GENERAL ELECTRIC CO.
WASHINGTON WATER POWER CO.

What to do—

To capitalize on the traffic making possibilities of coffee makers it is only necessary to have them up front and keep them active. Keep a live demonstration going if at all possible. The inviting odor of good coffee draws people to the demonstration. Over a sample taste of good coffee, freshly made, it is easy to learn by questions what kind of coffee making the prospect uses, how many there are in the family (to recommend the proper size) the number of cups usually consumed, the furnishings, (so that you can recommend style) and other information that will help you talk in terms of **her own** needs and desires. When you do, you help the prospect sell herself and to say "yes" when you suggest that you wrap one up or have it delivered.

Besides the regular day-to-day selling of electric coffee makers and percolators, there are these special opportunities. Play them up in windows and store for **wedding gifts** in May and June. Associate them with entertaining for **football season, Hallowe'en, Thanksgiving, New Years.** Play them up big for **Christmas gifts.** Find out what the superior advantages are to the higher priced quality lines so that you can sell more in that bracket at better margin. For example, the extra-large size percolator set serves as a hot water server for hot drinks during holiday seasons. Certain types can be used to brew tea. Others are a special drip type coffee maker. In fact there is a type you can sell to meet any discriminating coffee taste.

—and How

motion pieces, and the company itself will use newspaper advertising and billboards along the same line.

On new range installations, where the range is bought from a retail dealer, the company grants the customer an allowance of $35 toward the installation cost. Since this cost averages $42.50, the customer pays only $7.50.

To be sure that it obtains replacement of old, non-automatic electric ranges, the company makes a trade-in allowance of $20. If the dealer makes this allowance, he turns the old range back to the company and receives $20 credit.

The company is continuing the payment of a $5 advertising bonus to dealers on each direct sale of a range.

Although it is the company's policy to make these range concessions over a long period of time, rather than for a short campaign, extra effort will be made twice this year to sell more ranges. These drives come in April-June and September-October.

Quota for electric water-heater sales is only 70 this year—as compared with 1,250 gas water heaters.

California-Oregon Power

Most dealers cannot afford to handle old ranges traded in on new ranges because they are not equipped to modernize the equipment. Therefore, reason some power companies who are anxious to maintain top-notch dealer relations, it's up to us to help the dealers out.

That's exactly what California-Oregon Power has done. It has inaugurated a used-range "blue book" establishing maximum trade-in allowances for various models. This is used by both company and dealers as a guide in pricing allowances.

The company buys all used electric ranges from the dealers at the blue-book price less 20%. It then rebuilds these ranges and resells them as used merchandise. The advantages are evident:

The dealer secures an immediate market for used equipment. Every transaction is kept clean, so he does not tie up his profit in stuff which may or may not sell.

From Copco's standpoint, the program encourages the dealer to help maintain modern and satisfactory load sources, and it provides the company with equipment which can be rebuilt and sold in the lower income brackets.

It's true, of course, that many ranges taken in are so old and broken down as to be useless for modernization or resale. But the company gains by removing this equipment from use, because operating results and maintenance cost are unsatisfactory to every one concerned.

OVER
53,000
Electric Ranges
Used by Seattle Housewives Daily
Proving THAT THE MODERN HOME
IS AN Electrical Home.
With the purchase of an Electric Range, your old stove has a trade-in value, which allows for the Electric Range wiring if needed, also . . . in addition, a substantial credit to apply on your Electric Range.
This wiring offer does not apply on new homes now under construction.
It is economical to combine with the lighting in your home the use of an Electric Range, an Electric Refrigerator and an Electric Water Heater.
CITY LIGHT & POWER
J. D. ROSS, Supt.
CITY LIGHT BLDG. • ELIOT 7600

Seattle City Light ad

Coast Counties G. & E.

At present, Coast Counties Gas & Electric Co. has scheduled no special range or water-heater activities. All prospects point to a normal year.

Ranges are sold on either an installed price or a not-installed price. The latter is the manufacturer's list; the former is the list plus $15. Water heaters are sold similarly, the installation fee amounting to $10.

A special 30-gal. water heater is for sale at all times at $49.50 not installed, or $59.50 installed.

Idaho Power

Sales expectations for Idaho Power Co. this year are 3,500 ranges and 1,900 water heaters. This means that 7% of the company's customers will buy ranges; a little less than 4% will buy water heaters. Of the totals, dealers are supposed to sell about 60% of the ranges and 30% of the water heaters. First-quarter sales indicate that these quotas are set about right.

Highlight of the selling program so far this year has been the nine-week range campaign entitled the "Cookery Quiz" (ELECTRICAL WEST, April 1939). Up to April 11, over 7,000 customers had entered dealer stores to get information on this drive. During the first five weeks, sales totaled 550.

Started on April 3 was the company's nine-week spring water-heater campaign. Quota for the drive is 600 units, dealers accounting for one-third. To encourage salesmen to sell larger heaters, special commissions will be paid to utility and dealer salesmen. These start at $2 for a 30-gal. water heater or farm tank and run up to $5 for a 40-gal. straight electric installation.

Other than prizes given away in the "Cookery Quiz," the company offers no special inducements such as free wiring, trade-in allowances or premiums.

Los Angeles Bureau

"The outlook for the sale of electric ranges and water heaters on our system for 1939 is very good," reports A. W. Elliott, of the business agents' division of the Los Angeles Bureau of Power & Light.

"Indications are that there will be added 7,000 ranges and 2,500 or more water heaters during the year. Included in these totals are our sales to employees, which will account for approximately 400 ranges and almost as many water heaters."

There have been no basic changes in the bureau's sales policy for several months. The wiring policy is still the same—$15 for each range and water heater, plus $25 for service equipment of 100-amp. capacity. This policy is, however, restricted to approved ranges and water heaters.

The bureau's range specifications now require enclosed surface units, adequate-sized ovens with at least 11-in. vertical clearance, not less than three surface units and total range capacity of not less than 7,500 watts.

Montana Power

Fear of Montana's Fair Trade Practices Act has been causing trouble with Montana Power Co.'s range-wiring policy.

To set this aright, a managers' meeting was held the week of April 17. It was decided that the company will meet with dealers and wire men of each locality and reach an understanding as to the proper charge for wiring in that locality. This might be $25 in some towns and $40 in others. Then this charge can be immediately quoted to the customers.

Heretofore, a definite bid was necessary on each job. This doused the customer in cold water twice within a couple of days—once when the price

of the range was mentioned; a second time when the high cost of range wiring was mentioned.

Except for this new development, the company's policy is the same as in the table. There are no price concessions, no additional trade-in allowances and no customer incentive. The usual bonuses to salesmen are now in effect during the April-June range campaign.

Nevada-California Electric

Nev-Cal's outlook for the sale of ranges and water heaters is about the same for 1939 as it was for 1938. Since the company boasts a high saturation on its system, no large increase is expected.

P. G. & E.

Sales reports for the first three months of this year indicate that Pacific Gas and Electric Co. will show a substantial increase in range and water-heater business over 1938. This is particularly true of water heaters.

According to A. C. Miller, appliance merchandise manager, the reduction of water-heater prices has done a lot to stimulate activity in rural areas. "At the present time," Miller reports, "the proportion of water heater sales to range sales is at the highest point we have ever experienced."

The company will tie in with the Modern Kitchen Bureau's national advertising plan this spring.

Portland G. E.

Although Portland General Electric Co. wound up its own selling operations last year, it was one of the few properties in the country to show a range-sales increase over 1937. So far this year, sales have been equally good. During March, for instance, dealers sold 375 ranges and 145 water heaters. Furthermore, prospects for material increases in coming months are very bright.

In March the company tied in with the Modern Kitchen Bureau's water-heater activity. Also participating were 125 dealers. Company advertising featured the award each week of an automatic, storage-type water heater to the customer writing the best 50-word story on "I want an automatic electric water heater because . . . ." These stories to be eligible for competition had to be taken to a cooperating dealer's store and signed by the dealer or one of his salesmen.

Beginning April 10, the company launched its spring range campaign. Offer was made to conduct cooking classes for all prospects willing to attend.

Water-heater sales are also expected to increase because of an order by the Public Utilities Commissioner of Oregon that the company must serve 3,000-watt single-unit water heaters as well as the standard two-unit heaters.

Puget Sound P. & L.

Up to the first of this year, Puget Sound Power & Light sold ranges at a lower markup than the regularly established retail price. At that time, however, an agreement was reached with Seattle City Light enabling the company to raise retail prices to list.

Right now, dealer sales of ranges are showing an increase over last year; company sales, a decrease. A portion of this dealer increase is due to the larger number of dealers now selling ranges in the territory. But the general situation is encouraging, because of the interest dealers are taking.

Water-heater sales by dealers show little or no change from those of last year. However, company sales are materially higher.

Stimulation of appliance sales in the territory is partly the result of the adoption by the company of the Electric Home & Farm Authority's dealer financing plan. This permits dealers to finance the sale of appliances on a reasonable basis, the billing being cared for by the company.

The company has no special promotional activities, such as trade-in allowances, premiums or special bonuses, either for dealers or itself.

San Diego Consolidated

Range and water-heater sales in San Diego Consolidated Gas & Electric Co.'s territory started out rather below 1938 figures, but prospects picked up considerably during March and it is expected that year-end figures should be higher than last year.

Last month the company held a drive to sell non-corrosive water heaters to those customers who had ranges but were heating with other fuels. To encourage salesmen to cooperate more fully, increased bonuses were given to salesmen regardless of whether the heater was sold by the company or by dealers. Trade-in allowances up to $15 for old water-heating equipment were allowed on the price of the new heater, completely installed. Heaters were sold on down payments of $10, the balance in 36 months. Price charged was the regular list plus installation.

Although no basic changes in the

HOW UTILITIES SELL RANGES

	Cal.-Ore. Pr.	Idaho Pr.	L. A. Bureau, P. & L.	Montana Pr.	Nev.-Cal. Elec.	Northwestern Elec.	P. G. & E.	Pacific P. & L.	Portland G. E.	Pub. Service, Colo.	Puget Sound P. & L.	San Diego Cons.	San Joaquin Pr.	Sierra Pacific Pr.	Southern Cal. Ed.	Southern Colo. Pr.	Utah P. & L.	Wash. Water Pr.
Do you encourage range sales with																		
Bonuses to salesmen	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y		Y	Y	Y	Y
Bonuses to dealers	Y					N			N		N	Y		Y		Y	N	N
Cooking schools	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y
Trade-in allowances by dealers			Y			Y	Y		N		N	Y	Y				N	N
Trade-in allowances by utility	Y			Y	Y	N	Y	Y	N	Y	Y	Y			Y	Y	N	Y
Do you make free installation allowances for ranges																		
Sold by dealers	Y	N	Y	N	N	N	N	N	‡	N	N	N	N	N	N	N	N	N
Sold by utility	Y	N	Y	N	N	N	N	N	‡	N	N	N	N	N	N	N	N	N
Do you participate in installation costs		N	Y	N	N	N	Y	N	‡	N	N	N	N	Y	Y	Y	#	N
To what extent ($ per installation)			15*				15							35	††	5		
What is average cost of installing 60-amp. service on your lines ($)	29		40	38		29†	100	27½	29	28	30	35	45	45		25	22½	25
Do local ordinances encourage 60-amp. service in new dwellings	N	Y	N	Y	N	N	Y	Y	Y	Y	N	N	Y	Y	N	Y	Y	N
Is 60-amp. service compulsory in new dwellings	N	N	N	Y	N	Y	N	Y	Y	Y	N	N	N	N	N	N	Y	N
Do you require cable and plug connection	Y		Y	Y	Y	Y		N	N	Y	N	N	N	N	Y	N	N	Y
Does utility or distributor supply dealer with cable and plug pigtail	U		D-U	D	U	U									D			

*$25 for 100-amp. service switch with not less than three No. 2 wires in reimbursement cases. In other cases, free wiring given.

†For complete range wiring. ‡Company connects range and outlet free.

#Company charges straight $22.50 for installation.

††Company supplies service entrance units.

One of Utah Power's series of uniformly styled and appealing advertisements

BE a Dictator from now on. Install an Automatic Electric Water Heater in your home, then issue "orders" to Reddy Kilowatt that you "demand" hot water at a turn of the tap 24 hours a day, 365 days a year. And you'll get it. For your "command" will be instantly obeyed. Of course, you must have a "subject" capable of obeying your "command." Your furnace, for example, can supply hot water only during the heating season . . . and the heating season soon ends. But with an Automatic Electric Heater (which supplies hot water at an average cost of less than $3.00 a month) you can have all the hot water you need at a turn of the tap . . . anytime. Come in — let's talk it over.

As Little As
$5 DOWN
and
$3.50 A MONTH
buys an
Automatic Electric
WATER HEATER

SEE YOUR DEALER OR
Utah Power & Light Co.

ENJOY BETTER LIVING WITH CHEAP ELECTRICITY

company's range policy have been made recently, an additional program to boost sales may be put into effect later this year.

Southern Calif. Edison

"Range sales," says H. C. Rice, manager of domestic sales for Southern California Edison Co., "are approximately 9% ahead of last year. Water-heater sales are somewhat behind.

"We consider this an extremely good showing on the part of ranges in view of the fact that we discontinued all cash allowances Jan. 1. We continued, however, the giving of service entrance units."

Cost of range installation in Edison territory is $32.50. This was found by averaging the prices charged by contractors who take care of all installations. This cost has now been accepted as standard, and all dealers are expected to add it to the price of the ranges. The result is a uniform installed price for all customers. The company handles the transaction between the dealers and contractors.

Having just closed a campaign on Westinghouse ranges, the company started another on Hotpoint ranges April 21. It is also advertising and urging dealers to offer a 5% trade-in allowance for old equipment or a set of aluminum ware valued at $14.25 (the company purchases this ware and makes it available to dealers at cost).

Southern Colorado Power

When, last December, Southern Colorado Power Co. set its quotas for 1939, it figured on a 15% increase in range and water-heater sales. However, sales for the first quarter of 1939 show a decrease of 20% under the same period, 1938.

Because of extensive cooperative advertising and sales meetings conducted by the Pueblo Electrical League, dealer sales, on the other hand, show an increase of 30% for the same period.

The company's sales policy on ranges and water heaters is practically the same as last year. There is no free wiring, and trade-in allowances are held to a minimum. No special premiums are allowed.

Utah P. & L.

Quotas set up for Utah Power & Light and its dealers call for the sale of 3,950 ranges and 1,550 water heaters by the end of this year. Since there is considerable activity throughout the industry on these items, the company entertains high hopes for success.

For instance, water-heater sales to date are 53.4% higher than last year. And during the first five weeks of the current range campaign, featuring a set of $25.10 aluminum ware offered in combination with the range (ELECTRICAL WEST, April 1939), sales of 310 ranges were made.

Washington Water Power

Washington Water Power Co. plans to increase the sales of ranges and water heaters approximately 50% over last year. This means that 3,300 ranges and 2,500 water heaters must be sold. The increase is to be made by greater sales coverage by the company plus the encouragement of more dealer activity.

"We do not plan any sort of subsidy in the way of free wiring, premiums or exaggerated trade-in allowances," says R. B. McElroy, manager of residential sales. "The money formerly spent on these inducements will be used in promotional advertising over the name of the Inland Empire Electrical Equipment Assn.

"Past experience has proved that temporary subsidies are effective for a very short time, are very costly and act only as a temporary expedient. They are not sound and do not accomplish the purpose for which the money spent in general promotion and increased manpower is intended."

It's said that distribution problems are getting tougher in the electrical appliance business. General Electric Dealer Don Goodrich, of Placerville, Calif., proves it by delivering a refrigerator to W. A. Spidell, operator of a P.G.&E. power house. The power house is part way up a canyon in a mountainous section. The refrigerator had to cross the canyon by aerial tram to a narrow-gage railway which carried it the rest of the way. Here's the tram before loading, then as it was a few minutes later swinging uncertainly but safely, high above the canyon

Oregon Order

Points way to greatly simplified water heating

Water heating can be very much simplified; off-peak and other similar controls are unnecessary.

Such is the substance of a recent order by the Oregon Public Utilities Commission. The decision was reached after a year of hearings.

The order directs Portland General Electric Co. to permit use in its service area of single-unit, 3,000-watt electric water heaters of standard factory make, either of the immersion or circulating type. Service must be furnished this type of heater, or two-unit heaters of standard factory make, without load-limiting or control devices of any kind until there is demonstrated to the commission the need of installation of such devices. The order further directs all Class A, B and C utilities in the state to conduct within a year experiments to demonstrate the necessity for continued maintenance of such control.

Peak-load limiters are declared unnecessary. The utilities are also directed to survey regulations having to do with installation and insulation of water-heating tanks and pipes, tempering tanks, furnace coils, etc. Where these are found to place an unnecessary cost on the installation of heaters, they are to be revised in order to remove objectionable features and cause the least possible burden of cost consistent with efficient performance.

Far-reaching in its effect, this decision, it is believed, will have a material influence upon other commissions and cause a review of the necessity for off-peak or controlled water heating in other Northwestern states.

During the investigation, it developed that load-limiting relays or peak-load limiters, balancing ranges against water heaters under conditions of normal diversity, failed to reduce the transformer, feeder or system demand in an amount sufficient to justify the cost of their installation, and that their use should be discontinued or restricted only for such installations where the value of the appliance could be demonstrated.

Another of the "Findings of Fact" listed by the commission was as follows:

"That the best evidence before the commissioner is that the cost to the utility of the metering, control and load-limiting equipment is approximately $28 per installation; and that the present difference between the cost of standard 2-unit heaters, as compared to single-unit, 3,000-watt water heaters of standard make, is from $20 to $40 per installation in favor of the latter type; and that this differential, plus the $28 for control and load-limiting appliances, brings the cost of an electric heater to a level of some $48 to $68 more than would be the case if the single-unit heaters, uncontrolled, were used."

The commissioner also contended that effort to protect themselves against system demand had not been realized in nearly seven years of operation by the utilities involved, and that the utilities had "forced upon themselves and upon their many off-peak water-heating customers an investment not yet justified and which perhaps might never be justified unless and until water-heater saturation brought about the almost unforeseen condition where this load alone would require of utilities additional installed generating capacity."

Future Campaigns

More about Western selling drives & special events

Following utility-dealer campaigns and special events have been announced for the next several months:

Arvada (Colo.) Electric Co.—May cooking school.

B. C. Electric Railway Co.—May and June, active promotion on ranges, refrigerators and water heaters. During May the company will tie in with local Home Improvement Plan Exhibitions in suburban sections of Vancouver. During June, there will be special June bride promotion on appliances.

Coast Counties Gas & Electric Co.—May and June, range and roaster campaigns.

Denver Electrical League—May and June, adequate-wiring, refrigeration and fluorescent-lighting campaigns.

Home Gas & Electric Co., Greely, Colo.—May, Westinghouse cooking school.

Idaho Power Co.—April and May, water-heater campaign.

La Veta (Colo.) Light, Heat & Power Co.—May clean-up sale of IES lamps.

Los Angeles Bureau of Power & Light—In the range campaign which started April 3, both bureau and dealers will present a number of demonstrations calculated to surprise and impress prospects with the benefits to be derived from an electric range. Eggs are fried on paper plates; water is boiled in a paper drinking cup; fish is broiled on a piece of brown wrapping paper without burning the paper.

Montana Power Co.—May and June, range and refrigerator campaigns.

Nevada-California Electric Corp.,—May, refrigerator campaign; June, range campaign.

New Mexico Public Utilities Corp., Gallup—May and June, adequate-wiring campaign.

Northwestern Electric Co.—May, refrigeration campaign; June, table-appliance campaign.

Pacific Gas and Electric Co.—May and June, range campaign. No special inducement will be made to prospects or salesmen. The company will advertise in June only.

Portland General Electric Co.—May, range

campaign; June, water-heater campaign.

Public Service Co. of Colorado, Denver—May and June, campaigns on IES lamps, lamp bulbs, fluorescent lighting, refrigeration and air conditioning. Sterling Colo.—May, range, refrigeration and lamp campaigns and cooperation on local newspaper school. June, the same campaigns and cooperation on all-electric home.

Puget Sound Power & Light Co.—May and June, range, water-heater and refrigerator campaigns.

San Diego Bureau of Radio & Electrical Appliance—May and June, refrigerator campaign.

Sheridan (Wyo.) Electrical League—May, refrigeration campaign; June, range campaign.

Southern Colorado Power Co.—May and June, range, refrigerator and water-heater campaigns.

Southwestern Public Service Co., Roswell, N. M.—May, roaster campaign and cooking demonstrations; June, evaporative cooling campaign. Carlsbad, N. M.—May and June, adequate-wiring and lighting campaigns.

Utah Power & Light Co.—May, campaigns on home lighting, cooking, water heating, irons and table cookery. June, campaigns on refrigeration, cooking, water heating and small appliances.

Valley Electrical Supply Co., Fresno, Calif.—May, roaster campaign; June, range and water-heater campaigns.

Western Public Service Co., Laramie, Wyo., and Las Animas, Colo.—May and June, campaigns on clocks, ranges, refrigerators and water heaters.

Sales Shorts

Adequate wiring; campaigning; display service; skating

BY THE END of last month virtually every electrical user in Denver had been personally called on by one of 200 trained men who explained the desirability of and necessity for adequate wiring. The survey, undertaken by Public Service Co. of Colorado and the Rocky Mountain Electrical League, is believed to be the most comprehensive job ever attempted in this country. The activity is being conducted in connection with a canvass designed to acquaint customers with the advantages of the utility's recent $1,051,600 rate slash.

CAMPAIGN AN APPLIANCE and you will sell it regardless of season. Such, at least, is the experience of Washington Water Power Co. For proof, R. B. McElroy, manager of residential sales, points to a recent lamp drive. Actually the campaign started last October, but it was continued over the first two months of this year. "The surprising thing," says McElroy, "is that the Feb. 6-March 11 period of the drive, because of aggressive promotion including full advertising schedules, went far above average results for other periods of the campaign. Coeur d'Alene division showed 260% of quota, and the entire system averaged 159% of quota." Did it pay to campaign lamps after the Christmas season? Well, it meant that one IES lamp was sold every 15 min. of the day for Washington Water Power.

TRAVELING DISPLAY service for all appliance dealers has been organized by B. C. Electric Railway Co. An experienced display man and window dresser is in charge. For a small sum each month he will visit any dealer store and take care of display requirements.

LOS ANGELENOS stopped, looked and bought refrigerators when Los Angeles Furniture Store recently arranged a window display in which a blond and beautiful girl skated on an artificial ice rink flanked by a row of refrigerators.

APPLIANCE SALES REPORT, 1939

A Summary of Dealer and Utility Reports Compiled by Associations, Societies, Bureaus, or Dealer Contact Departments of Utilities

REPORTING COMPANIES	Idaho Power Co.[1]		Northwestern Elec. Co.[2]		Montana Power Co.[3]		P. G. & E. Co.[4]		San Diego Cons. G. & E. Corp.[5]		San Joaquin Power[6]		Southern Calif. Edison Co., Ltd.[7]		Utah Power & Lt. Co.[8]		Wash. Water Power Co.[9]	
	Current	3 Mos.	Current	‡Mos.	Current	†Mos.	*Current	*2 Mos.	†Current	†Mos.	Current	3 Mos.	Current	2 Mos.	Current	2 Mos.	Current	3 Mos.
Ranges	386	638	359				282	534			112	324	117	281	135	416	124	375
Water Heaters	124	216	94				216	423			49	169	53	109	20	34	83	200
Air Heaters, aux.	60	185					677	1,521			6	101	166	544	84	233	46	299
Air Heaters, 220							95	204			26	136						
Refrigerators	383	639	900				2,204	4,593			395	721	1,568	3,237	292	944	564	1,082
Dishwashers	1	3					11	19			1	3			1	2		
Washers	448	1,232	793				2,032	4,521			226	622	1,635	3,666	704	1,214	427	1,076
Ironers	33	139					364	856			24	79	197	477	50	124	28	83
Vacuum Cleaners	171	395	453				2,327	5,101			44	213	983	2,192	361	689	223	652
Radios	739	2,233	1,643				8,482	17,930			374	1,343	3,433	8,106	1,429	4,564	1,352	3,994
Mixers	61	161					260	566			21	127	215	597	83	424	106	350
Cookers, Casseroles	7	46									14	69	92	254	43	138	180	568
Irons	459	1,174									164	623	968	2,091	651	1,967	604	1,626
Waffle Irons	102	347									42	255	284	738	231	984	137	420
Toasters	252	581									85	361	416	1,015	259	958	343	1,009
Table Stoves	214	477	2,030								57	196	218	447			70	423
Heating Pads	98	299									29	168	238	595	141	459	101	319
Curling Irons													42	86	56	188		
Coffee Makers	211	526									80	416	190	462	291	1,030	351	1,027
Sewing Machines							423	838			13	13			203	347	89	216
Clocks	165	392									81	439	378	967	220	719	238	583
Fans	10	32	57								6	9	12	26	5	17	23	72
Floor Polishers																		
Sun Lamps	27	88											57	119	8	17	9	36
Reflector Lamps	451	1,103	1,803								101	455			583	1,680	1,587	3,982
Miscellaneous Lamps	794	1,557													738	1,532	837	2,321
Yard Lights											42	117			40	112		
Misc. Small Appl.											74	325						

SOURCES

[1] Figures compiled by Electric Equipment Sales Association. Include power company sales of all reporting dealers.

[2] Lists appliances sold by dealers in Portland area. Figures compiled by Northwestern Electric Company.

[3] Combined dealer and company sales from report of Montana Power Co.

‡ No previous figures reported by company; those above are for March only.

[4] P. G. & E. reports sales of major appliances only based on accurate reports from dealers' accounts. Ranges, water heaters and air heaters include company and dealer sales. * Due to delays in compiling report current and total figures are always one month behind those figures of companies reported in other columns of this table.

[5] Gathered by Bureau of Radio and Electric Appliances of San Diego County. Estimated monthly sales figures used in this table: Miscellaneous figures includes fans, curling irons and sun lamps.

[6] Includes dealer reports from Midland Counties Public Service Corporation also. Compiled by Valley Electrical Supply Company.

[7] Includes reports from dealers on San Joaquin Valley system of company as well as Southern California areas served.

[8] Includes Utah Power & Light Company territory in Utah, Idaho and Wyoming. Also Western Colorado Power Company territory.

[9] Dealer sales only for Spokane and company territory. Company sales not included. Table stoves, grills included with cookers.

† March figures were not available at time of going to press.

ELECTRICAL WEST

The All-Industry Magazine of Progress

Established 1887 and Incorporating the "Electrical Journal," "Journal of Electricity, Power & Gas" and "Journal of Electricity"

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Tax Comparisons

SO unfair and misleading is the recent report of the Federal Power Commission comparing rates and tax equivalents of privately and publicly owned electric utilities that an element of doubt immediately arises as to the purpose of the study. Instead of a factual document, it might reasonably be classed as propaganda for the public ownership zealots.

Taxes paid by the privately owned companies are known quantities. These were compared with "estimated" contributions paid by municipal plants. The report shows that for the year 1936 *actual* taxes paid by municipal utilities were 1.2 per cent of revenues, that in 14 states no taxes were paid at all. However, these figures are buried. So is the figure of 14 per cent representing taxes paid by privately owned companies. No mention is made of the fact that in 1938 this figure had increased to 17 per cent.

More "estimates" were made of the value of free service rendered by municipal plants but no offsetting allowances were made for free services received, such as rent, accounting, legal and other services rendered by city departments. Nor does the report take cognizance of millions in free capital, interest and maintenance expenses saved by PWA allotments and WPA expenditures.

In many sections of the country the public is becoming increasingly conscious of the loss of tax revenues occasioned by any kind of a municipal or government ownership venture. Such knowledge was instrumental in forestalling an extension of government ownership in Nebraska. Some day the public will awake to the fact that neither the Bonneville plant nor the proposed $100,000,000 Bonneville transmission system will pay any taxes. And neither do many other federal power projects. To attempt to delude the public by outright propaganda such as is contained in the FPC study is shameful.

Danger Ahead

DOES the electrical industry want another wave of anti-utility merchandising legislation such as swept the country a few years ago? Memory of the bitterness, suspicion and ill-feeling that accompanied that experience should be sufficient to preclude any new ventures into competitive merchandising.

The dealer has every right to view with suspicion any proposed plan which contemplates shortening his margin, reducing his profit or breaking his market. Some of the "special" campaigns which are being contemplated by both utilities and manufacturers do all of these things. Resentment is certain to result if these plans blossom into being.

So cordial have been the relationships which have been built up between utilities and dealers in this Western region during recent years that nothing should be done to disturb them. As a matter of fact, more can be accomplished by stimulating a greater degree of understanding and cooperation than by any temporary expedient designed to move merchandise or build domestic revenue. Future development of the domestic market is something that is going to require all of the manpower and all of the merchandising brains that the industry can muster.

"I Am the Government"

DURING the hearing of a recent case before one of the numerous federal alphabetical agencies, counsel for the government in cross-examining a witness asked a question which is typical of a growing and dangerous point of view. "Why do you oppose the government in this matter?" the witness was asked.

"You forget," the witness answered, "I am the government."

Thus the government agent was reminded for whom it was that he is supposed to work—not an authoritarian overlord, "the government," but the people.

The implication of both the question and the answer was discussed by Laurence W. Davis, manager of the National Electrical Contractors Assn., at the California contractors meeting at Fresno. This point of view needs to be brought forcibly home, Mr. Davis declared. Government in this country is an instrumentality of the people; the people are not mere puppets of a government. To this end he wisely counseled electrical contractors and everyone else in the industry to pay far closer attention to legislation, to the selection and election of congressmen and state legislative representatives. In Europe the people have defaulted their own destinies to the wills of their leaders and have become slaves to a governmental mechanism. With indifference and lack of vigilance "it can happen here" too.

Consciousness of government grows with the restrictions and the imposition of financial burdens under which every businessman and every individual suffers increasingly. The remedy lies not in complaints and abuse of elected representatives. It lies in electing better men and seeing to it that they truly represent the people who support them.

Thanks to a free press and radio, the examples of the European alternative are brought home to our people without glamor and in true perspective. It is not yet too late to maintain in this country a government which really represents the people and is responsive to the needs of business and individuals.

Kite Prevention or Cure?

LAZILY floating in the sky, a kite may be a thing of joy to a small boy. But to the utility it often represents an economic and life hazard. Kite strings tangle with high voltage lines and the small boy may lose his life or industry may be shut down as a consequence.

Until recently no positive educational effort was made to prevent kite accidents. Now most companies do some work of this nature. Yet measured in terms of spending a penny to save a dollar, far more could be done with such educational prevention. The "cure" still costs far too much in legal fees, ill-feeling, and even economic loss. One company had the experience of shutting down a paper mill for 30 min. as a result of a kite accident—a serious economic loss.

In spite of warnings, damage claims against a company are usually paid rather than fought through the courts. Each costs several thousands of dollars. The cost of one case would finance an educational movie that could reduce the number of such accidents enough to pay for itself over and over each year. One company with a record of 40 years standing of kite accidents each year experimented with an educational movie. It was shown in schools throughout its system and for the first time in that 40 years there were no accidents.

A new crop of boys grows into the kite flying age each year so education on safety cannot stop. The life of one such boy itself is worth unremitting effort to prevent kite accidents. Any parent will tell you that.

Job For Movies

WINTER to the power company is no season of joy. Throughout most of the West, heavy snows, ice and howling winds combine to mow down, break and otherwise disrupt power lines. To cause shortages which bring customers' complaints down on unhappy heads.

Yet winter, with all its ferocity, might well do the power company a good turn. It can help make friends.

More and more as the years go by we see newspaper ads extolling the strength and courage of the linemen, pointing out how utility employees brave the elements to maintain service. The effect is good. None but the most skeptical reader can resist the effort, however cursory, to stop, think and nod his head. "Yes, those men are brave. There's something to be said in favor of a company which will fight like that to keep my lights burning."

But chances are the effect might well be bettered. How? By motion pictures.

Movie critics and Hollywood addicts may bemoan the down-hill slide of recent motion pictures. But pictures are, nevertheless, more popular than ever. Women's clubs, Rotary clubs, civic clubs—all manner of organizations of men and women—are constantly falling back on motion pictures for their meeting entertainment and in hundreds of cases, they are depending on the productions of industrial organizations.

Here then is an opportunity. Expensive? Without doubt. But well worth the expense and effort.

For what person, seeing the picture of that Public Service Company of Colorado crew which toiled through ten- to thirty-foot snow at an elevation of 13,000 feet, all for the purpose of restoring a tower which had been torn out by a snowslide and thus maintaining service, would not stop, think and nod his head? "Yes, those men are brave. That company deserves our faith and support."

So we ask: Why shouldn't a movie camera accompany a line crew dispatched to repair damage done by a winter storm? Why indeed—since people show such intense interest in all things mechanical—shouldn't a movie camera accompany almost any crew which is working to maintain or build for the first time service for the customers?

PCEA

Shifts convention to Pasadena; changes date to May 24-26

Place and time of the annual meeting of the Pacific Coast Electrical Assn. were suddenly changed last month when the City of San Francisco decided to vote May 19 on a municipal ownership proposal.

Immediately the election was announced, it was realized that attendance at the meeting, originally scheduled for Del Monte, May 17-19, would be seriously hurt. PCEA directors therefore shifted the convention to the Hotel Huntington, Pasadena. Date: May 24-26.

Despite this unexpected change, the program arranged by H. S. Warren, general convention chairman, is virtually unaffected. It covers an exceedingly wide range of interesting subjects. Details follow:

WEDNESDAY MORNING, MAY 24

8:00 Registration
General session
Vice-President W. W. Glosser, chairman

10:00 Opening address
President A. E. Hitchner

10:20 "The Electrical Industry and Electrical Development in the 11 Western States"
George W. Malone, consulting engineer; manager, The Industrial West

11:00 "Present Conditions and Future Tendencies of Electric Service in the Pacific Northwest"
Leroy A. Grettum, vice-president & general manager, Eastern Oregon Light & Power Co.

11:35 "Always New Frontiers"
George A. Lewis, executive manager, Rocky Mountain Electrical League

12:15 Luncheon
Inspirational address

WEDNESDAY AFTERNOON

2:00-5:00 Parallel Sessions

Operating Economics Section
J. F. Davenport, chairman
A. G. Jones, vice-chairman

Production and Substation Group
H. A. Lott, discussion leader
1. Newly developed methods of decreasing maintenance costs in substations and generating stations
2. Problems involved in the grounding of neutrals of rotating equipment, including relay protection

Transmission and Distribution Group
J. B. Madden, discussion leader
1. Coordination and protection of 4-kv. circuits, including (a) multi-grounding, (b) single grounding, (c) grounding through a transformer and (d) communication problems arising from grounding
2. The extent of demand for joint use of poles where higher distribution voltages are involved, and the resultant over-all economies which might be obtained

Meter Group
W. N. Lindblad, discussion leader
1. Problems of sequence meters and service requirements
2. Test periods and meter accuracy limits
3. Miscellaneous meter problems and practices

Business Development Section
R. J. Holterman, chairman
W. E. Cranston, Jr., vice-chairman

Red Seal and Ordinance Committee

Demand and Diversity Factors Committee
C. E. Heise, chairman

Industrial Power and Heating Committee
G. N. Hawley, chairman

Handbook Revision Committee
A. L. Laws, chairman

Highway Lighting Technical Subcommittee
W. P. Bear, chairman

Air Conditioning Committee
H. H. Douglas, chairman

Administrative Services Section
A. D. Church, chairman
G. C. Delvaille, vice-chairman

Customer Relations Audit Group
E. A. Long, presiding

Transportation Group
E. C. Wood, presiding
1. Company owned vs. rental equipment
P. H. Ducker, discussion leader
2. Centralized vs. decentralized maintenance
S. B. Shaw, discussion leader

Credit and Collection Group
S. W. Murray, presiding
Charles Davies, discussion leader
1. Uniformity of customer deposits
2. Cooperation between companies on follow-up collection of delinquent accounts
3. The exchange of credit information
4. Shutoff policy and procedure—reconnection charges
5. Merchandise accounts. How they are passed on and handled
6. Time-payment contracts

Accounting Group
F. C. McLaughlin, presiding
1. Depreciation
(a) Theories for computing reserves
(b) Accounting for realized depreciation

WEDNESDAY NIGHT

9:00 Technicolor Motion Picture — "Steel, Man's Friend."
Courtesy of Columbia Steel Co.

Laurence W. Davis and Carl Severin at the contractors' meeting in Fresno

THURSDAY MORNING, MAY 25

9:30-12:00 Parallel Sessions

Operating Economics Section
J. F. Davenport, presiding
1. Summary of group-meeting discussions
W. N. Lindblad, H. A. Lott, J. B. Madden
2. Report of Committee on Simplified Standards for Distribution Lines
S. J. Lisberger, chairman
3. Report of Committee on Occupational Segregation and Improvement
F. R. George, chairman

Administrative Services Section
Continuation of committee meetings

Accounting Group
F. C. McLaughlin, presiding
Unit cost and retirement accounting symposium of member companies

Business Development Section
9:30-10:30 Continuation of committee meetings

10:30 General assembly of entire section
R. J. Holterman, presiding
Paper—"The Cost of Light from Modern Sources," presented by W. P. Bear, P. G. & E.

THURSDAY NOON

12:15 Luncheon
P. M. Downing, chairman
"The Electric Utilities Today"
Bernard F. Weadock, vice-president and managing director

THURSDAY AFTERNOON

General session
C. E. Houston, presiding

2:00 "The Question Box"
R. E. Smith, chairman, industry information committee

2:40 "The Relation of Utility Systems to Defense of the Pacific Coast"
Col. L. H. Stanford, 9th Corps Area, Headquarters: Presidio, San Francisco

3:30 "Industrial Progress"
E. O. Shreve, vice-president, General Electric Co.

4:20 "Weather Forecasting as Applied to Industry"
Dr. Irving P. Krick, associate professor of meteorology, California Institute of Technology

THURSDAY NIGHT

9:00 "A Hurricane's Challenge"
Courtesy of Pac. Tel. & Tel.

FRIDAY MORNING, MAY 26

General Session

9:30 "Spectacular Color Effects Produced by Means of Polarized Light"
H. L. Doolittle, Southern California Edison Co.

10:30 "The Electric Power Utilities Tomorrow"
N. G. Symonds, vice-president, Westinghouse Electric & Mfg. Co.

11:30 Annual meeting
Report of officers
Election of officers

11:50 Adjournment

FRIDAY AFTERNOON

Golf

FRIDAY EVENING

6:30 Cocktail party for all delegates
Arranged by manufacturer, manufacturers' agent and wholesale members of the PCEA. Frank Angle and W. D. Howze in charge

7:30 Banquet and vaudeville entertainment

10:00 Dancing

Contractors

Take a look at laws & labor, and how they affect business

No longer a local and individualistic business is electrical contracting. Government, legislation, other industries or other branches of the electrical industry, and the state of the building market all force upon the electrical contractor the need for association and collective action.

This was the serious and rather new note that echoed throughout the con-

centrated one-day meeting of the electrical contractors of California, in Fresno, April 22, the first joint meeting of both northern and southern California groups since Bakersfield in 1929. Sponsored by the Electrical Contractors Assn. of Northern California and the 11 chapters of National Electrical Contractors Assn. in southern California, the guest of honor was Laurence W. Davis, manager of NECA, New York. His message on national matters, the new sales tax ruling interpreted by sales tax chief T. H. Mugford, and discussion of the new labor relations policy of NECA and IBEW were the marrow of the convention program.

Answering the oft asked question, "What do I get for my dues?" Davis sketched the advantages of belonging to an association, summing up with the thought that no member can pay for nor could he afford to buy the study, experience, judgment and work of other members who carry on vital activities on behalf of all members. He spoke of the democratic nature of associations in solving business problems, told of national pressures watched by NECA, such as codes and legislation.

Saying that contractors have but two things to sell, their own engineering and supervisory knowledge and the skill of the mechanics who work for them, Davis outlined the principles under which the new labor relations committee of NECA has been set up. Its purposes are to join the efforts of contractor and wireman in selling more wiring to the public, arbitrate any labor difficulties amicably, and assist local associations.

To restrain the present tendency of administrative officers of the government to issue arbitrary rulings, Davis urged support of the administrative law bill of the American Bar Assn. now before congress. He also urged support of the Walsh bill calling for the naming of subcontractors by general contractors in submitting of their bids. At the noon luncheon, to an all-industry group, Davis spoke of the national adequate wiring, the forthcoming industrial electrification and the commercial wiring programs.

Ending several years of confusion as to the manner in which sales tax applies to electrical construction work, a new ruling and an amendment to the sales tax law were explained by T. H. Mugford, chief, sales tax division, California Board of Equalization. In July the new ruling will permit contractors to pay their sales tax to the wholesaler or other supplier on all materials used in construction. Full details of the new ruling will be sent every contractor in the bulletin issued by the California Contractors' License Board.

A. L. Stone, executive committeeman for NECA District 9, told of decisions made at the recent meeting; spoke of the cost of field activity, hoping that both northern and southern contractor associations would join in support of field representation. Clyde Chamblin, District 9 representative on the NECA labor relations committee, outlined its thinking and the need for establishment of a strong contractor group to be able to work on cooperative business development programs with labor.

Amos Feely, assistant to J. Scott Milne, vice president of International Brotherhood of Electrical Workers, addressed the meeting on the latter's behalf. He spoke convincingly and sincerely, reciting personal experience in contractor problems and illustrating the new viewpoint of electricians in recognizing that unless contractors sell more work they cannot be employed.

Left to right—H. Eklund, George Brouillet, A. L. Stone and L. W. Davis

J. D. O'Connor, chairman of the legislative committee, reported on state legislation of vital interest to contractors, as did Wm. Varley, representative of the San Francisco association. Support of AB-1098 which would provide a long wanted force of inspectors to give better enforcement of the Safety Orders of the Industrial Accident Commission was strongly urged.

Kenneth Ryals, president of the northern California association presided over the concentrated one day meeting. Fresno contractors, headed by Ted Curry, provided hospitality for the large representation.

Accountants

Northwesterners to meet in Vancouver, May 26-27

Utility accountants of the Pacific Northwest will gather for the 14th annual meeting of the Northwest Electric Light & Power Assn. at the new Hotel Vancouver, Vancouver, B. C., May 26-27, under the chairmanship of S. A. Horner, B. C. Electric Railway Co.

E. H. Adams, vice-president, B. C. Electric, will welcome the delegates to Vancouver. Response will be by LeRoy A. Grettum, vice-president and general manager, Eastern Oregon Light & Power Co., and president of the association. Accounting topics to receive consideration at the meeting are: "Original Cost as a Basis of Reclassification of Property Accounts," "Internal Auditing," "Credits and Collections" and "Payroll Procedure with Respect to New Regulations as to Wages and Hours."

Because of the visit of the King and Queen (May 29) and the nearness of the Memorial Day holiday, many delegates are planning to take their wives. Special entertainment will be provided accordingly. The usual annual banquet, this time to include the ladies, will be held at the hotel May 26.

Agenda

A few short items about the doings of Western associations

Following are the past and future activities of various Western electrical organizations:

Electrical Maintenance Engineers' Assn. of Southern California—Met April 18 to hear Harry B. Welch, Western Precipitation Co., talk on the collection of dust and fumes in industry.

Los Angeles Chapter, NECA—Heard F. L. Hockensmith and Graham Holabird describe an industrial and commercial modernization plan. L. W. Davis spoke at the April 24 meeting. Next meeting will be held May 22 at the Clark Hotel.

Old Baldy Chapter, NECA, Pomona, Calif.—Meets every Thursday night for study of the state code, leading up to examinations for master and journeymen electricians. Recent speakers were F. H. McMahon, F. A. Short and H. G. Ufer.

Santa Barbara Chapter, NECA—Regular business meetings are held second and fourth Thursdays of each month. The Western Institute of Light & Vision presented better lighting programs last month.

San Francisco Pot & Kettle Club—Has changed its meeting day at the Western Furniture Mart from Tuesday to Friday.

East Bay Electric Club, Oakland—Speaker April 17 was E. A. Whitehead, General Electric Co. on "Lumens and Load on Treasure Island." Speaker April 24 was A. J. Kercher on "The Central Valley Project and How It Can Be Made to Pay for Itself."

Electrical League of Utah—Speaker in Salt Lake City, March 22, was Howard Jones, Morrison-Merrill Lumber Co., on "Modern Arrangements of Kitchens and Cabinets." On March 21, 55 members heard James M. Ketch, General Electric Co., talking on new light developments. Orson John Hyde and Ora H. Barlow, both of Mountain States Telephone & Telegraph Co., talked April 19 on the new dial system to be employed in the telephone exchange a-building in Salt Lake City. Arthur Schanuel, National Adequate Wiring Bureau, is scheduled to speak this month.

Irradiation

Of milk increases vitamin D content and opens a large market

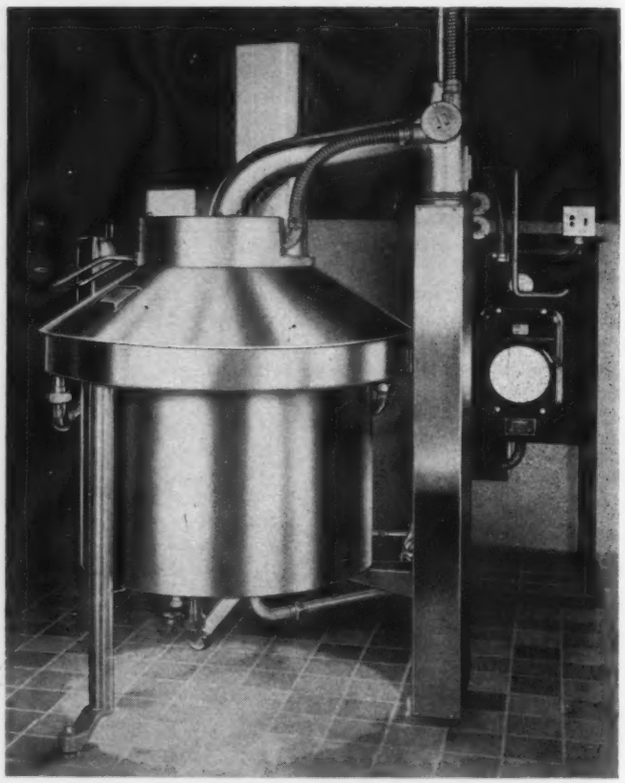
Irradiation of milk to increase the vitamin D content offers a new and growing electrical application in the dairy industry. Experiments have proved that by causing the milk to flow in a thin film past a powerful source of ultra-violet radiation, the vitamin D content is materially increased. This fact is of advantage to both the dairy industry and the consumer of dairy products. Milk contains several of the vitamins and is one of the few foods containing the vitamin D, sometimes referred to as the anti-rachitic vitamin. Unfortunately the modern dairy cow, as now fed and cared for, produces milk with only about one-tenth the supply of vitamin D necessary to prevent rickets.

Milk is being irradiated in numerous dairies in Sacramento, Modesto, San Rafael, Los Angeles and other California cities, as well as in communities in other Western states. A small type of irradiator using carbon arcs as the source of ultra-violet radiation is employed. A new type of irradiator, having large capacity and positive action has only recently been developed by the National Carbon Co. in cooperation with the Wisconsin Alumni Research Assn.

This provides a unit of sanitary construction, economical to operate and adapted to small floor space. It consists of a stainless steel drum of cylindrical form with an annular trough around the top from which the milk flows in a thin film down the inner surface of the cylinder. A powerful 3-phase carbon arc lamp supported in a central position within the cylinder provides strong ultra-violet radiation for activation of the milk. A constant head tank permits gravity flow of milk through the irradiator. Double baffle rings at the top of the cylinder eliminate surging and maintain a uniform and evenly distributed flow of milk around the entire circumference of the cylinder. Glass-covered observation ports on opposites sides allow inspection of the arcs and the milk without interruption of the operation.

This unit is capable of irradiating from 4,000 lb. of milk per hour with an activated potency of 400 USP vitamin D units up to 17,000 lb. per hour with a potency of 135 USP units. The flow of milk, and hence the vitamin potency, is controlled through orifices between the head tank and the distributing trough.

The three-phase carbon-arc lamp used as a source of ultra-violet rays is a new development. It has a capacity of 12 kw., which assures a high ultra-violet output at an essentially constant level. The flame-type carbons employed have a burning life of 4¾ hr. The lamp is equipped with a motor-driven carbon-feeding mechanism controlled by an automatic relay located in the control cabinet, and has an automatic warning signal which indicates when retrimming is necessary. The lamp is designed to operate on a three-phase 230-volt line. Current at each arc is 80 amp. with 50 volts across the arc. The irradiator is equipped with transformer and control cabinet.



National Carbon Co.'s new irradiator

Low operating cost is one of the advantages of this high-capacity unit. Tests show that with a rate of 1c per kw.-hr., the over-all operating cost for both carbons and energy is less than $0.00006 per quart of fluid milk with a potency of 135 USP vitamin D units.

Advantages of milk fortified with vitamin D have received general recognition by the medical fraternity. The human body requires the greatest amount of this anti-rachitic substance during the period when it is growing most rapidly, i.e., during the first year of life. All people require it until they reach maturity, if bones and teeth are to develop properly. The irradiation of milk automatically supplies the anti-rachitic factor that is deficient in the majority of food products available in modern times in quantities sufficient to prevent rickets.

Irradiation of milk is more positive and more efficient than irradiating cows' udders or the feeds supplied them, both of which are methods of providing vitamin D that have been tried in past experiments.

From the standpoint of the dairyman, irradiation provides an attractive merchandising story which more than offsets its cost. This advantage can be used as a talking point in advocating an installation.

Hastening Blooming

Flowers burst forth when heaters and lights are combined

By combining fan-driven electric heaters and electric lights some remarkable results have been obtained by Washington flower growers in hastening the blooming of various flowers. By holding the temperature in a greenhouse above 50 deg. F. with circulating heaters, results were secured which surpassed previous experiences with conventionally heated greenhouses.

In a test in a 20x50-ft. greenhouse at the nursery of C. L. Wight at Woodinville, Wash., narcissus were brought into bloom in 12 days as compared to 28 days in a normal greenhouse. The greenhouse was equipped with a glass roof with the remainder of the structure insulated with Celotex board painted with aluminum paint. Temperature was maintained with five 2-kw. fan-driven heaters, the fans operating continuously and the heaters controlled by thermostats. Twelve 150-watt lamps in aluminum reflectors were placed 4 ft. above the beds. Lights operated from dusk to 10 p.m. The entire installation was in operation a month, during which 15,000 blossoms were produced with an energy consumption of 2,059 kw.-hr.

Cost of Light From Modern Sources

By W. P. Bear

ORDINARILY we think of the cost of lighting as the cost of electricity consumed per hour. We should also think of the *over-all total cost* which reasonably includes the cost of the fixture in place plus the cost of the relamping and maintenance. The objective here is to make a thorough analysis of the cost of obtaining light from approximately a dozen of the most commonly used modern fixture assemblies.

The following calculations have been based on the net over-all cost of delivered light (generated lumens), available over a term of 9,000 hours (six years) of use, to *the average small store on Main Street.* This includes all of the cost of light except wiring up to the point where the customer begins to utilize it and for a sufficient length of time sensibly and equitably to charge-off the cost of the installation.

Obviously, comparisons as between different assemblies really must be comparable and in order to be fair to any make of fixture or to any type of lamp or to any assembly selection, some basic assumptions must be established.

The class of user is "the average small store on the Main street of your town." This will include drug stores, hat and suit shops, clothing and shoe stores, cigar and specialty shops, hardware stores, restaurants, etc., and will represent a very large percentage of all of the commercial fixtures sold or kilowatt-hours consumed. The basis of comparison is *net generated lumens.* In order to compare the light generated in so many different combinations and modern types of light sources, it was found necessary to make two very precise selections. One task was to select the fixture assemblies to be compared and the other to select a large enough light-total or common denominator into which the fixture assemblies would equally well fit. It was found that about 10 different fixture assemblies would suffice and that a common denominator of 44370 lumens was close enough for all practical purposes. These selections are outlined in Table II.

The time involved, 9,000 hours, is a long enough term during which the prudent shopkeeper should charge off the cost of wiring and fixtures. It will equalize the long-term lease-holder with the intentional short-term occupancy plus the financial failures involving the mortality which prevails in this class of business. It is equivalent to the use of the lighting fixtures for 5 hr. per day for 300 days per year for 6 years.

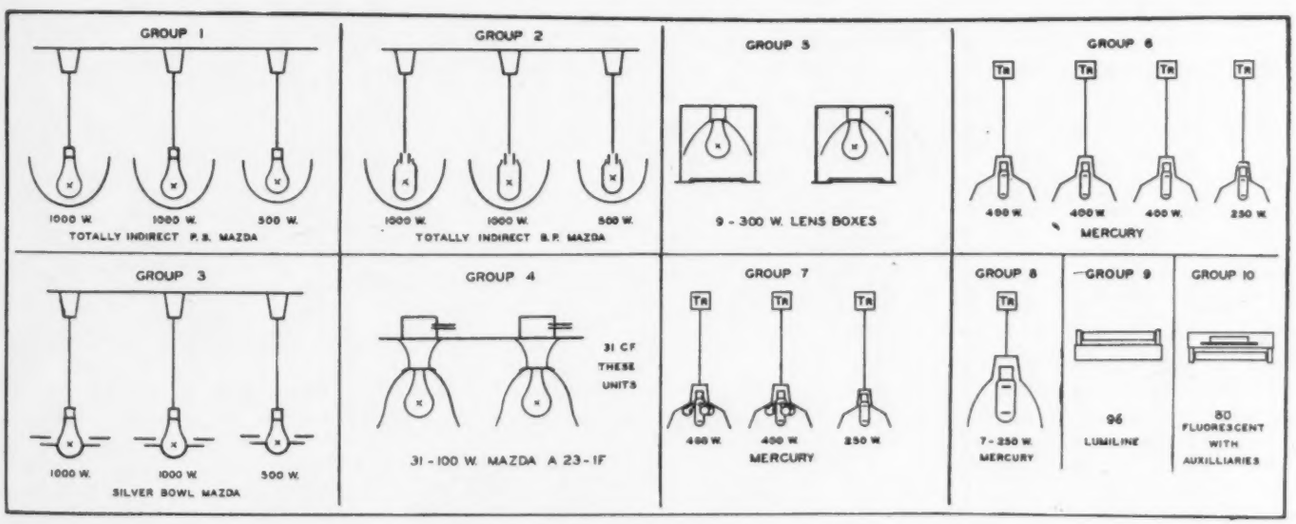
Since any selection of fixture might very well fit on any kind of a wiring job and since the purchaser might decide to install either a good job or a poor job of wiring or may, perchance, already have his wiring in place, we can do no more than to assume that normal voltage will be delivered through the wiring system up to the base of the lamp. Therefore, the cost of wiring is not included. By the same token a customer may decide to build almost any kind or size of a room space or enclosure around a fixture and select any one or more of hundreds of color combinations for walls, ceilings or furnishings; therefore, it is within reason to assume that we must eliminate the coefficient of utilization which involves the determination of room index, the output efficiency and the reflectivity of walls or ceilings. This study stops where the customer begins to utilize the light.

It is very natural that someone will think of color quality. Since the color quality is not predominantly involved in the lighting of the "small store on Main Street," it is not considered herein as an asset or a liability. Nor is any color correction assumed to be involved. The color of the light source is accepted as it is.

Lamp life and efficiency have been assumed to be those set up in the lamp manufacturers' tables.

The average lumen output of lamps has been taken as 100%, less one-half of the estimated end-life drop in efficiency. Replacement is assumed to be made at the end of estimated life.

The cost of the fixture in each case is the average cost of a large number of popular makes and types of the particular assembly in question. The nominal cost of hanging the fixture and cost of the lamp is included in the price in place. Although wiring systems generally are not included, it seemed fair to include the outlet box and about a foot of conduit and wire for the assembly of 100-watt Mazda lamps and to include the cost of sockets, wiring strip, wire and auxiliaries for some of the new tubular types of lamps, but not the wire and conduit which lead up to these assemblies. It is assumed that



Combinations and types of fixtures and lamps used

Table I—Lamp Prices and Their Operating Characteristics

Type of lamp	Cat. designation	Watts each	Retail price	Total initial lumens	Initial lumens per wt.	Rated life in hours	% Avg. lumens over life	Average lumen output over life
Mazda	PS-52 Cl.	1000	$4.00	20700	20.7	1000	86	17800
Mazda	PS-52 Cl.	750	3.75	14550	19.4	1000	87	12650
Mazda	PS-40 IF	500	1.30	10050	20.1	1000	84	8440
Mazda	BP T-24 IF	1000	3.75	19600	19.6	1000	92	18000
Mazda	BP T-20 IF	500	2.25	9700	19.4	1000	90	8730
Mazda	PS-35 Cl.	300	.70	5760	19.2	1000	85	4900
Mazda	A-25 Cl.	150	.20	2610	17.4	750	86	2250
Mazda	A-23 IF	100	.15	1580	15.8	750	90	1420
Sil. bowl	PS-52 IF	1000	6.00	19650	19.7	1000	82	16100
Sil. bowl	PS-52 IF	750	5.50	13800	18.5	1000	82	11300
Lumiline	T- 8 Cl.	60	.90	528	8.8	1500	87	460
Mercury	T-16 Cl.	400	12.50	16000	40.	2000	80	12800
Mercury	T- 9 Cl.	250	9.00	7500	30.	2000	85	6360
Fluor. 24"	T-12 Cl.	20	2.00	640 DL	32.	1500	87	555
Transf.	.95PF	50-W	$15.00	(Suspension-type good for 250/400 W. Mercury lamps)				
Transf.	.6 PF	7-W		(Thermal-type for Curtis strip. Use for 24" fluorescent)				

Table II—Assemblies to Deliver Approximately 44370 Net Lumens

Combinations, type of fixture and lamps used	Average lumens per lamp	Total lumens
2—1000-W PS-52 Mazda pend.	17800	44040
1— 500-W PS-52 Mazda pend.	8440	
2—1000-W BP T-24 Mazda pend.	18000	44730
1— 500-W BP T-20 Mazda pend.	8730	
2—1000-W PS Silver bowl	16100	43500
1— 500-W PS Silver bowl	11300	
31— 100-W A-23 IF Mazda	1420	44020
9— 300-W PS-35 IF lens	4900	44100
3— 400-W Merc. T-16 clear	12800	44760
1— 250-W Merc. T- 9 clear	6360	
2 { 1—400-W Merc. T-16 clear and	12800	
{ 3—150-W A-25 Mazda	2250	45460
1— 250-W Merc. T- 9 clear	6360	
7— 250—W Merc. T- 9 clear	6360	44520
96— 60-W Lumilines T- 8 clear	460	44160
80— 20-W Fluor. 24" T-12 DL	555	44400
Average for all assemblies		44370

Table III—Initial and Other Capital Costs

Fixture assembly	Original investment in place	6 years interest on half at 6%	6 years total depreciation	6 years insur. & taxes at 2%	3% sales tax	Total 6 yrs. initial & capital costs
2—1000-W PS Mazda 1 —500-W PS Mazda	$ 92.50	$ 16.65	$ 92.50	$ 11.10	$ 2.78	$ 123.03
2—1000-W BP Mazda 1— 500-W BP Mazda	73.80	13.28	73.80	8.86	2.21	98.15
2—1000-W Sil. bowl 1— 750-W Sil. bowl	126.50	22.77	126.50	15.18	3.80	168.25
31— 100-W IF Mazda	55.80	10.04	55.80	6.70	1.67	74.21
9— 300-W lens	270.00	48.60	270.00	32.40	8.10	359.10
3— 400-W Merc. 1— 250-W Merc.	220.50*	39.69	220.50	26.46	6.62	293.27
2 { 1—400-W Merc. 3—150-W Mazda 1—250-W Merc. }	185.20*	33.34	185.20	22.22	5.56	246.32
7—250-W Merc.	315.00*	56.70	315.00	37.80	9.45	418.95
96— 60-W Lumiline	480.00	86.40	480.00	57.60	14.40	638.40
80— 20-W Fluor.	762.00*	137.16	762.00	91.44	22.86	1013.46
	$2581.30	$464.63	$2581.30	$309.76	$77.45	$3433.14

*These items include capacitors to improve power-factor to 90%.

Table IV—Lamp Replacements and Maintenance

(For 9000 hours of operation)

Fixture assembly	Life of comb.	No. times replaced	Unit cost replace	Nominal total cost of replace. lamp	Nominal total cost of replace. labor	Cost of Maint. per replace	Total cost Replace & maintenance
2—1000-W PS Mazda 1— 500-W PS Mazda	1000	9	$ 9.30	$ 83.70	$ 4.50	$ 4.50	$ 92.70
2—1000-W BP Mazda 1— 500-W BP Mazda	1000	9	9.75	87.75	4.50	4.50	96.75
2—1000-W Sil. bowl 1— 750-W Sil. bowl	1000	9	17.50	157.50	4.50	4.50	166.50
31— 100-W IF Mazda	750	12	4.65	55.80	10.00	10.00	75.80
9 300-W lens	1000	9	6.30	56.70	10.00	10.00	76.70
3— 400-W Merc. 1— 250-W Merc.	2000	4½	46.50	209.25	6.00	12.00	227.25
2 { 1—400-W Merc.	2000	4½	25.00				
{ 3—150-W Mazda	750	12	1.20	167.40	6.00	12.00	185.40
1— 250-W Merc.	2000	4½	9.00				
7— 250-W Merc.	2000	4½	63.00	283.50	7.50	12.00	303.00
96— 60-W Lumiline	1500	6	86.40	518.40	15.00	30.00	563.40
80—20-W Fluor.	1500	6	160.00	960.00	16.00	30.00	1006.00
				$2580	$84.00	$129.50	$2793.50

the small store owner pays a net retail price for fixtures, lamps and labor.

The total cost of light in this estimate is segregated into three separate groups as follows:

(a) The capital cost of the fixture and lamp in place.

(b) The cost of lamp renewal and maintenance.

(c) The cost of the electricity consumed.

As previously explained, the average cost of the luminaire includes the net retail price of the fixture and lamp in place ready to operate. It has been depreciated on a straight line basis in 6 years without any allowance for salvage. Interest on one-half of the investment of 6%, insurance and taxes at 2% per annum based on initial cost, and a 3% sales tax have been assumed. In explanation of these figures, not all improvement projects will fit in under FHA specifications; insurance is usually written for 3 or 5 years; the amount set up for capital taxes is certainly nominal and no one can escape the sales tax. The total amount of this element of cost is shown in column 2 of the summary sheet, Table VI.

The replacement of lamps is included at net retail prices. The labor cost of hunting a ladder, juggling it around counters, setting it up, and replacing the lamp and cleaning the fixture, is included at so nominal a figure that the cost cannot be criticized. It is assumed that the fixture will be cleaned when the lamp is replaced and cleaned frequently enough between times to maintain a good average output. The cost of maintenance has been included at so low a figure as not to elicit criticism. The character of maintenance affects about equally the output of any and all assemblies included in this analysis. The cost of lamp replacement and maintenance is shown in column 3 of the summary Table VI.

The cost of electricity at normal lamp voltage for 9,000 hours of burning is included at 3c per kw-hr. This is just a little above the average return realized by one large utility from the sale of commercial lighting and is considered to be a fair figure for small stores and shops. The total amount of this element of cost is shown in column 4 of the summary table.

Having now considered the inclusion or exclusion of about all of the variables entering into the cost of light at the point where the customer begins to utilize it, let us look at some of the assemblies of fixtures and facilities selected for possible installation in this "small store on Main Street." Column 1 of Table I indicates the types of lamps and auxiliaries that will be re-

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Table V—Cost of Electricity Consumed

Fixture assembly	Connected load in Watts	Kw-hr. used in 9000 hours	Cost of elect. at 3c per kw-hr.
2—1000-W PS Mazda 1— 500-W PS Mazda	2500	22500	$675.
2—1000-W BP Mazda 1— 500-W BP Mazda	2500	22500	675.
2—1000-W Sil. bowl 1—750-W Sil. bowl	2750	24750	743.
31— 100-W IF Mazda	3100	27900	837.
9— 300-W lens	2700	24300	729.
3— 400-W Merc. 1— 250-W Merc.	1650*	14850	446.
2 { 1—400-W Merc. } { 3—150-W Merc. } 1— 250-W Merc.	2100*	18900	567.
7— 250-W Merc.	2100*	18900	567.
96— 60-W Lumiline	5760	51840	1555.
80— 20-W Fluor.	2160*	19440	583.
	27320	245880	$7377.

*These items include the wattage losses of transformers.

quired to do the lighting job. Columns 2 to 7 of this table refer to the cost and characteristics of the lamps involved.

Column 1 of Table II describes the type and wattage or otherwise indicates the character of the assembly selected. Columns 2 and 3 of the table indicate the net-lamp lumens and total lumen output of the assembly combinations. It will be observed that the net total light generated in each assembly is close enough for all practical purposes to the common denominator of 44370 lumens to offset any criticism.

Table III indicates the cost of the assembly in place, the interest charge, depreciation, insurance and capital taxes, the sales tax and over-all total capital cost of each assembly. For gaseous tube light sources, the capital cost of each assembly includes the cost of capacitors to correct the power factor to 90%. Over-all the capital costs and charges amount to approximately one-fourth of the total cost.

Table IV indicates the number of lamp replacements required for 9,000 hours of burning. Fortunately, this is a good multiple figure for the lives of most all lamps. This table also indicates the cost of lamp replacement and the cost of labor to replace the lamps and the labor to maintain the fixture. The over-all cost of lamps and maintenance is shown in the last column and amounts to approximately one-fifth of the total cost.

Table V indicates the cost of energy used in 9,000 hours of burning. As in all previous tables, there is quite a wide variation as between assemblies. The influence of low lumen-per-watt lamps is readily discernible. The energy cost of fluorescent and mercury lighting includes the losses in auxiliaries. Over-all, the energy cost amounts to a little more than half the total cost.

Table VI is a summary of the three elements of the cost of lighting for each of the ten assemblies selected. From this and preceding tables some interesting deductions can be drawn.

(1) The several combinations of Mazda lighting and the higher wattage units of mercury lighting, singly or in combination with Mazda, are the lowest in cost and do not vary in price over a very wide range.

(2) Silver bowl lamps, small wattages in mercury and lens-type downlighting are about 1½ times the cost of ordinary pendant-type Mazda lighting.

(3) Lumiline lighting is about 3 times the cost of ordinary Mazda lighting due to the high cost of lamps and low lumen-per-watt output for equivalent total lumen output.

(4) Fluorescent lighting is about 3 times the cost of ordinary Mazda lighting because of the high cost of the original equipment and the high unit cost of lamp renewals.

(5) A low cost of electricity consumed is not an indication of low over-all cost of the light at the source.

(6) Lumiline lighting costs about $3 per foot including the mounting strip and fluorescent lighting costs about $5 per foot including the mounting strip.

(7) This survey deals with about $13,600 worth of lighting equipment and expense.

Table VI very well illustrates the important variables in the cost of lighting. It should be helpful when analyzing a lighting problem or talking to a customer about lighting. So far as it goes it provides dependable over-all costs. Should it be necessary to figure additional assemblies one can easily do so on the same or any other basis. Likewise wiring and as many variations in utilization as one may wish may be added.

Finally, it is certainly not intended that these figures or the conclusions drawn should dictate the type of light source anyone should buy. It should merely serve as a cost guide where other considerations are not involved. Where decorative effects are required, the cost of fixtures and the hourly cost of operation may not be the most important factor. Where color characteristics, coolness or styling are most important, it seems certain that fluorescent sources, even though the most expensive, might be the best selection. Bear in mind there has not yet been enough experience with some of the new sources to be real sure of life and lumen-depreciation and no one will find it an easy task to reconcile some of the claims made by some of the manufacturers and salesmen regarding the particular merit of their products.

As it now stands these figures are a revision of a first issue as of date November 1938. The changes in the original were made necessary (1) on account of a reduction in the prices of auxiliaries for fluorescent lamps, (2) by the estimated increase in the life of flourescent lamps and (3) by the addition of capacitors to raise the power factor of inductive type units to 90%. In working out this change the following question was developed: Why did not the manufacturers of auxiliaries put the recent reduction in unit cost of auxiliaries into an inherent improvement in the power factor at about the same cost per auxiliary? Such a move would have broken down a lot of sales resistance.

Table VI—Summary of All Costs

Fixture Assembly	Initial and other cap. costs	Lamp replac. & maint.	Cost of energy at 3c	GRAND TOTAL COST
2—1000-W PS Mazda 1— 500-W PS Mazda	$ 123.03	$ 92.70	$ 675.00	$ 890.73
2—1000-W BP Mazda 1— 500-W BP Mazda	98.15	96.75	675.00	869.90
2—1000-W Sil. bowl 1— 750-W Sil. bowl	168.25	166.50	743.00	1077.75
31— 100-W IF Mazda	74.21	75.80	837.00	987.01
9— 300-W lens	359.10	76.70	729.00	1164.80
3— 400-W Merc. 1— 250-W Merc.	293.27	227.25	446.00	966.52
2 { 1—400-W Merc. } { 3—150-W Mazda } 1— 250-W Merc.	246.32	185.40	567.00	998.72
7— 250-W Merc.	418.95	303.00	567.00	1288.95
96— 60-W Lumiline	638.40	563.40	1555.00	2756.80
80— 20-W Fluor.	1013.46	1006.00	583.00	2602.46
	$3433.14 (25%)	$2793.50 (21%)	$7377.00 (54%)	$13603.64 (100%)

Dust-Bowl Refuge

Kern County hospital modernizes its electrical equipment

Kern County General Hospital at Bakersfield, Calif., has been in the news because it has become a mecca for the dust-bowl refugees about to have an increase in the size of their already large families. But it deserves mention in the electrical news because not long ago it modernized a good deal of its electrical equipment. Gene Gartley, proprietor of Bakersfield Electric Co., describes the major changes as follows:

The hospital buys power from San Joaquin Power at 2,300 volts, and is fed by an underground service to the transformer vault in 2-in. conduit with three No. 6 lead-covered conductors to a 75-kva. transformer. This new pyranol transformer was installed to reduce fire hazard, since the vault is in the basement of one corner of the main hospital. A 60-amp., 3-pole, 2,300-volt oil switch is mounted where the service enters the building.

Distribution is taken from the secondary side of the transformer through the new main-line switch next to the meter coil can and thence in a gutter to the two distribution switches, one for the old peoples' cottages, the other for the home.

Extreme alkali soil conditions made it necessary to abandon all conduit previously put in the ground for secondary distribution. New 2- and 3-in. transite duct, 750 ft. in all, was run in the ground in 3-ft. ditches, connecting to manholes for sub-distribution to the cottages. A new transite duct was also run 250 ft. from the power company's pole at the street to a manhole and thence to the transformer room near the boiler room of the hospital.

It was even considered advisable to run in a duplicate feeder in a separate duct as an emergency feeder in case the corrosion of the alkali soil affected the main service feeder.

NEWEST of the school lighting surveys is one made by the pupils themselves. Eighth-grade students of Montecito Union Elementary School, Santa Barbara County, Calif., recently began making daily light-meter readings of illumination in the school's classrooms. So marked was the need of better lighting that the students requested the school board to modernize the schoolroom lighting. The old single fixture in each room was, as a result, replaced by six indirect lighting units, the inner row of three being controlled by a photoelectric cell.

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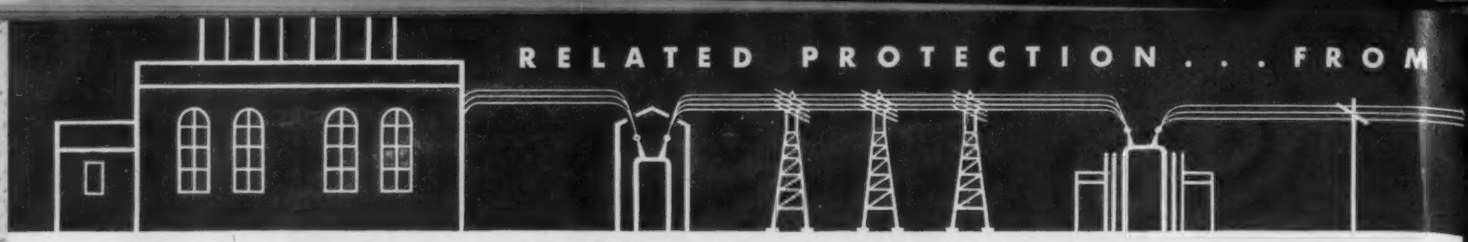

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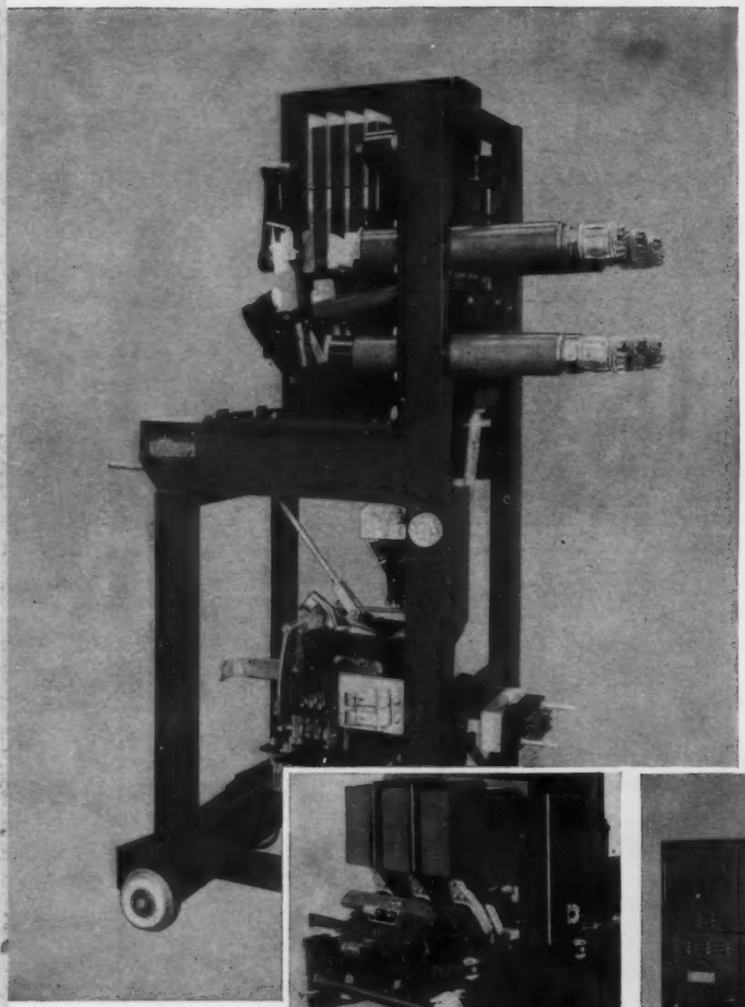
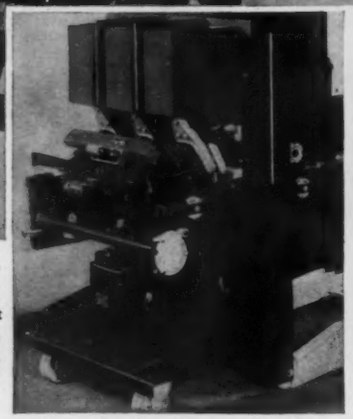


Type U "De-ion" Air Circuit Breaker, solenoid operated, removable truck unit. Nearest pole unit shows contacts with "De-ion" chamber removed — middle pole has pole unit barrier removed.

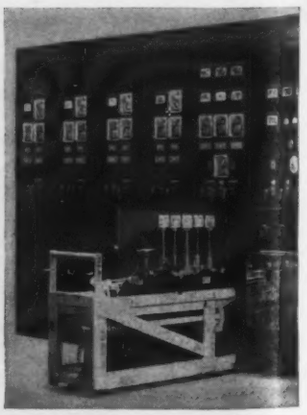
New TYPE U "DE-ION" AIR CIRCUIT BREAKERS . . . . .

Better "breaks" for 2500-volt circuits . . . new compactness and long life in high interrupting capacity breaker protection. Air breaker advantages with oil breaker economy in space — PLUS freedom from wear that enables them to be used almost like contactors for highly repetitive duty. Type U breakers operate in normal atmosphere — no oil, air pressure or vacuum is required. Exclusive Westinghouse "De-ion" arc extinction speeds action and makes possible new compact design.



For heavy-duty, low-voltage auxiliary protection. New type DA air breakers with "De-ion" arc quenching gives higher interrupting capacity with faster action.

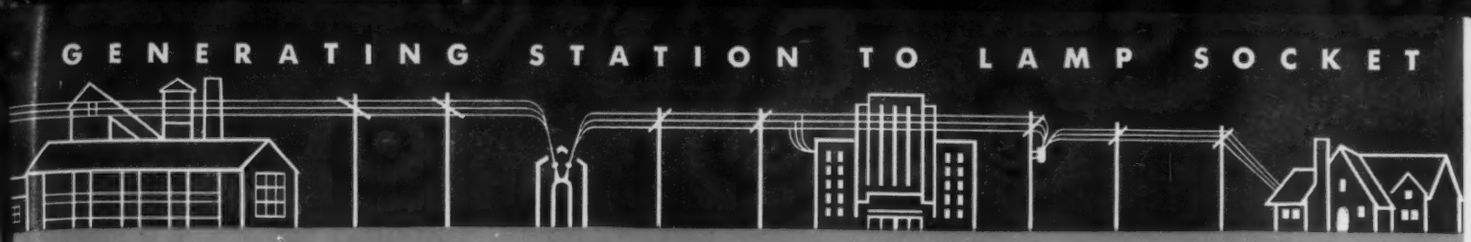
For medium capacity low-voltage auxiliary protection. Type AB "De-ion" air breakers with exclusive Westinghouse "De-ion" arc quenching action. Dead front, metal enclosed assembly occupies minimum space.



For high-voltage station auxiliary protection, a full line of common tank "De-ion Grid" oil circuit breakers gives "De-ion" arc quenching action.

WESTINGHOUSE ELECTRIC

Westinghouse



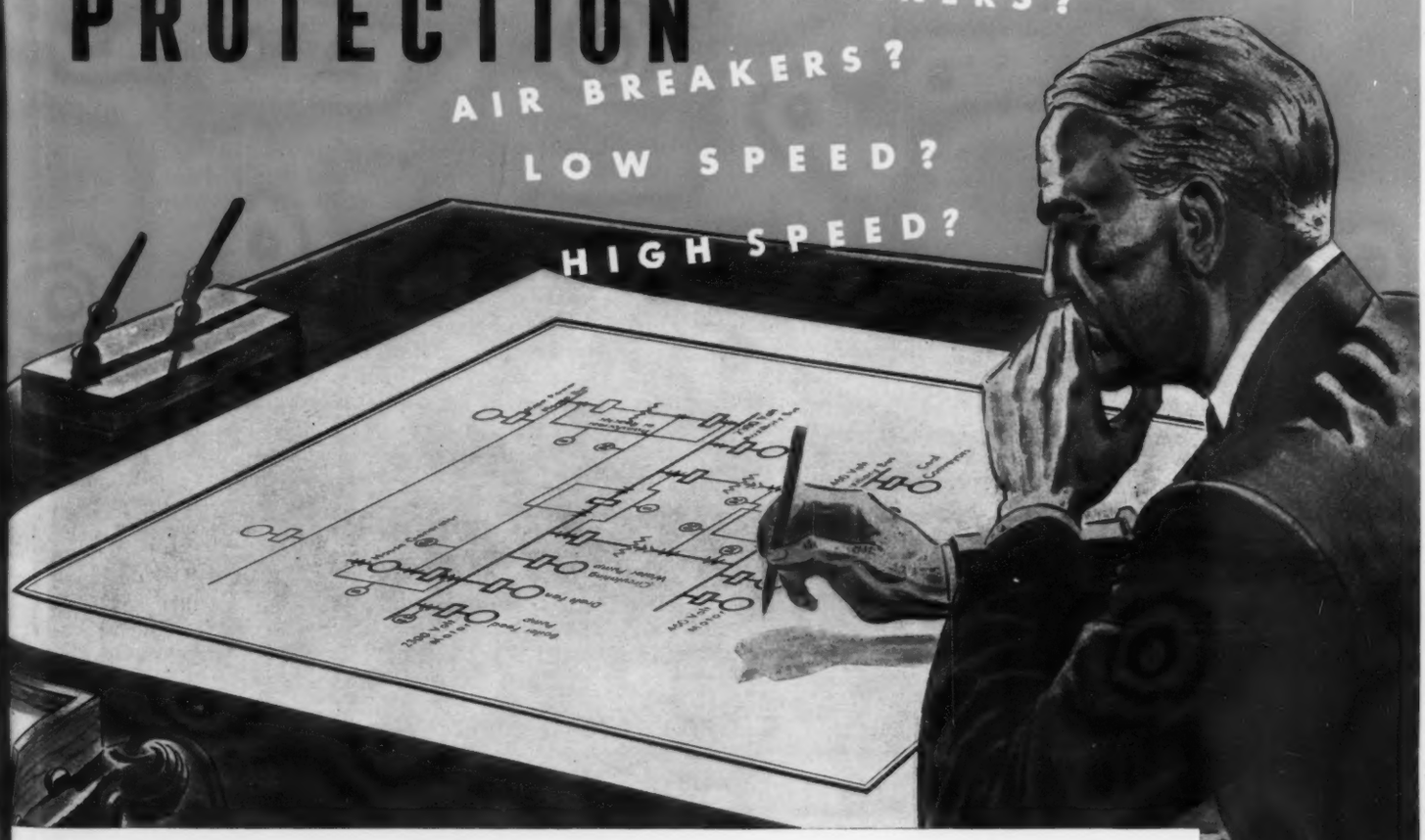
POWERHOUSE AUXILIARY PROTECTION

OIL BREAKERS?

AIR BREAKERS?

LOW SPEED?

HIGH SPEED?



WESTINGHOUSE OFFERS CORRECTLY *Related* PROTECTION REGARDLESS OF TYPE OR SPEED

Westinghouse RELATED PROTECTION does away with doubt. Protection for essential or non-essential auxiliaries of any voltage can be accurately co-ordinated, in capacity and speed of action, to insure known results when emergencies occur. Investigate the latest developments in RELATED PROTECTION for auxiliaries — get full details on Westinghouse equipment! Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-60303

Protective Equipment

NEWS OF THE INDUSTRY

SAN FRANCISCO TO VOTE ON MUNICIPAL OWNERSHIP

San Francisco will vote again on whether the city should go into the power business. The date of the election is May 19. It will mark the eighth time voters have been called upon to decide the issue at the polls.

On the ballot will be a charter amendment which would authorize issuance of revenue bonds; allow the Public Utilities Commission to build or to buy, and embody Plan 8, which the commission need or need not follow. It requires a majority vote.

Last year a similar proposal was defeated by 12,000 votes.

The election will bring to some kind of a head the long San Francisco-federal government fight over the disposal of Hetch Hetchy power through an agency agreement with Pacific Gas and Electric Co. To date the federal court has ruled that the city violated the Raker Act in disposing of power in this way. It is expected, however, that an appeal to the U. S. Circuit Court of Appeals will go on the court's calendar on May 15 and be argued about 60 days thereafter.

Plan 8 proposes a $55,000,000 issue of revenue bonds, interest not to exceed 6%. Out of this it is proposed to establish a city-wide distribution system, build a hydro plant at Red Mountain Bar (20,000 kw. with about 15,000 kw. firm), provide working capital, shops, etc. Transmission facilities would be leased and half or more of the energy purchased.

The $55,000,000 is $5,000,000 more than was proposed a year ago and is based, according to the commission. on actual book costs of P. G. & E.'s San Francisco electrical distributing facilities in 1937, plus betterments through 1938.

The vote on the issue was made possible at this time by a special election called for the purpose of deciding a measure which would give widespread salary increases to municipal employees. The salary measure is expected to attract a heavy labor vote, with problematical influence on the power proposal.

Nevertheless, one big question remains to be answered: What if the city voters do not choose to set up a municipal system?

The answer is not known, although Governor Olson has already indicated his interest in the fight by calling for copies of the court argument to date. And Secretary of Interior Ickes has indicated that the federal government may take over the marketing of Hetch Hetchy power.

"HOT" WIRE? PHOOEY!

All this talk about the dangers or efficacy of electric fences doesn't worry the 20 goats belonging to John Fletcher, of near Aberdeen, Wash., one bit.

Recently Fletcher, unable to control the herd's wandering with ordinary fencing, strung an electric wire about his place.

Next day he found all the insulation eaten off the connecting wires, the "hot" wire broken in several places—yes, and a herd of grinning, lively goats.

FLASHOVER KILLS TWO SUBSTATION REPAIRMEN

Roaring flame from a short-circuited 12,000-volt circuit breaker at San Diego Consolidated Gas & Electric Co.'s San Diego power house last month killed two men and temporarily disrupted city and county service.

The dead were Harold M. Dodge, 49, electrician, and Edwin J. Cook, 30, helper.

So far as can be determined, the accident occurred when Dodge enlarged his scope of activity without necessary clearance. Contact with the live side of the breaker caused a phase-to-ground short which developed into a phase-to-phase bus short spreading throughout the switching galleries.

Damage was estimated at $20,000.

According to Operating Vice-President L. M. Klauber, "the work order showed that Dodge ordered two auxiliary switches on each side of the big one opened. The orders were executed. But the main switch was not ordered cut out." For some reason, the breaker tank was lowered.

Service was interrupted for a few minutes to as much as 13 hours. Immediately after the accident an auxiliary gallery was put into service. When this failed to supply the city's power needs, an emergency supply was provided by Nevada-California Electric Corp. and Southern California Edison Co.

No equipment failed.

NORTHERN CALIFORNIANS START PROMOTION BUREAU

Plans are completed for the launching in northern California of an all-industry cooperative program aimed at the development of business in fields not now stimulated by local promotional effort. These include lighting and wiring in the commercial, industrial and residential fields.

Acting under resolution of the PCEA authorizing the use of the name, the Northern California Division of the Pacific Coast Electrical Bureau has been set up as an autonomous, local, self-governing organization. An initial annual budget of $20,000 has been established, $14,000 of which will be subscribed by Pacific Gas and Electric Co. and the balance by the other branches of the industry.

The initial program will center around wiring and lighting modernization in the commercial and industrial fields, surveys having indicated that in excess of $1,250,000 worth of business is available in San Francisco alone. Home wiring, based on the Red Seal-Adequate Wiring plan, will also be promoted, as will better lighting. This latter activity will include intensification of work by the Northern California Sight Conservation Council with special reference to school lighting.

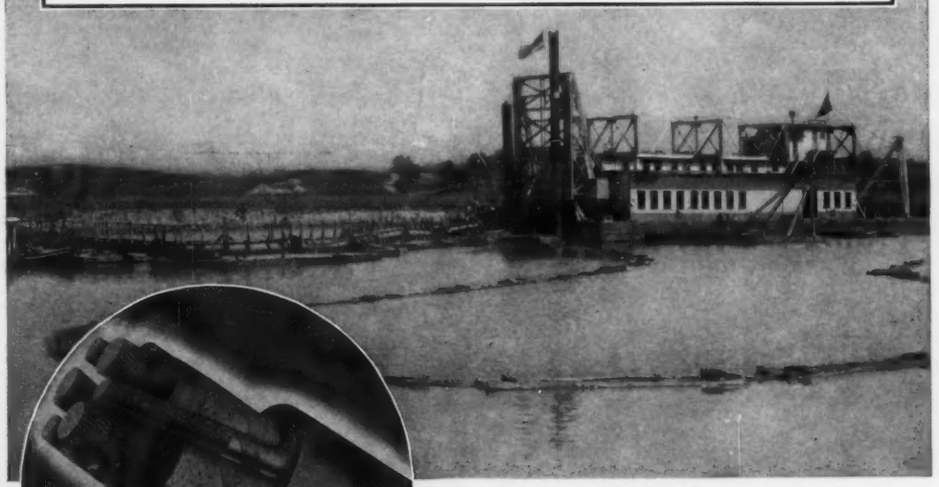
Governing body of the organization will be an advisory committee of 25 representative of all branches of the industry. Actual operation will be administered by an executive committee of eight members elected from the advisory committee.

O. R. Doerr, chairman of P. G. & E.'s sales committee has been elected chairman of the executive committee, membership of which consists of W. P. L'Hommedieu, Westinghouse Electric & Mfg. Co.; Ralph Peterson, Garnett Young & Co.; C. W. Goodwin, General Electric Supply Corp.; Walter Ayden, Electric Corp.; K. M. Ryals, Stone-Ryals Electric & Mfg. Co., and George C. Tenney, editor ELECTRICAL WEST.

Manager of the Bureau will be George W. Baker, at one time a member of P. G. & E.'s sales department, and later successively associate editor of ELECTRICAL WEST, vice-president of Allied Industries and more recently on the staff of the San Francisco and Oakland Industrial Associations. The staff will later be augmented to include a lighting engineer and an industrial electrical engineer.

IN THE "BIG LEAGUE"... OR IN THE "BUSHES"

You'll find Amerclad Cords and Cables Doing the Important Jobs



ONE-FOURTH ACTUAL SIZE

THIS AMERCLAD CABLE, rated at 13,200 volts, contains three insulated conductors, each 500,000 c.m., and three ground wires, each No. 4/0 A.W.G. flexible copper strand. It weighs nearly 18 pounds per foot and has an outer diameter of 4½". Each of the insulated conductors is electrically shielded by a braid of tinned copper wires. Between the rubber insulation and copper braid, in intimate contact with both, is a fabric tape specially treated to provide a semi-conducting layer.

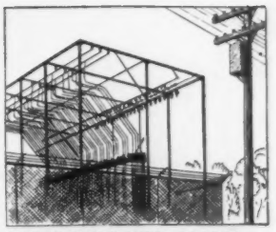
AMERCLAD *All-Rubber* CORDS & CABLES

THE Amerclad Dredge Cable illustrated here is the biggest of its kind in the world. Its job is to deliver power to the huge floating dredges used in the construction of the Sardis Dam—an important U. S. Government Flood Control Project.

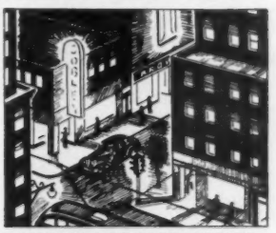
Today all jobs are important, whether big or little. And all along the line you will find Amerclad Cords and Cables doing big and little jobs efficiently and economically.

The outstanding features offered by Amerclad Cords and Cables are their rugged toughness, light weight and flexibility. An outer sheath of resilient "tire-tread" rubber protects the insulation from damage. Amerclad Cords and Cables are available in a wide range of types and constructions. Full details will be sent to you upon request.

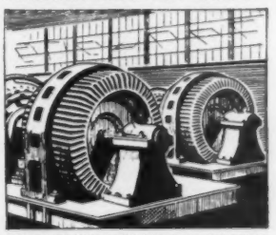
ADEQUATE WIRING SERVES AND SAVES



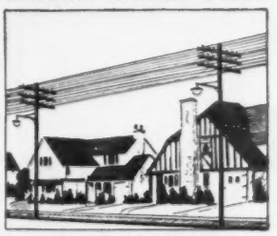
PAPER INSULATED CABLES



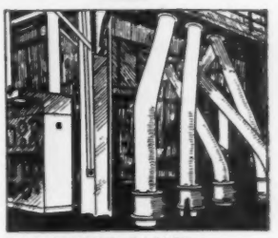
AMARINE NETWORK CABLES



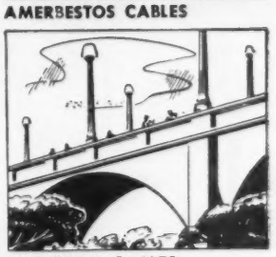
VARNISHED CAMBRIC CABLES



RELIANCE WEATHERPROOF WIRES



AMERBESTOS CABLES



PARKWAY CABLES

COLUMBIA STEEL COMPANY, *San Francisco, Pacific Coast Distributors of Amerclad All-Rubber Cords & Cables*

Manufactured by

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*

United States Steel Products Company, New York, *Export Distributors*

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Thanks to

G-E SPIRAKORE Transformers

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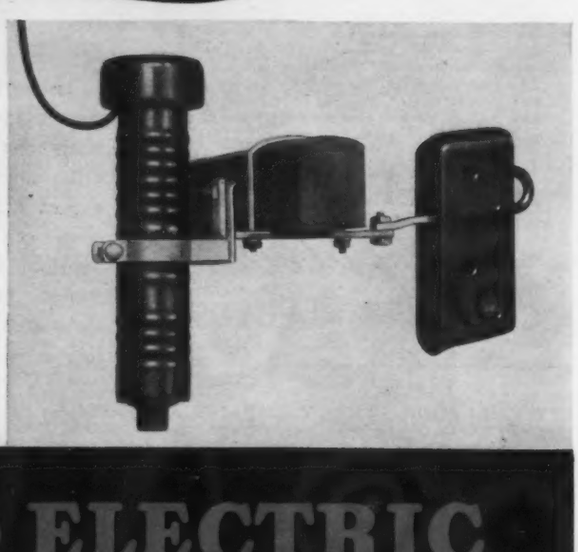
construction has made an outstanding contribution toward greater economy in serving lightly loaded areas. Ask for Bulletin GEA-2421



For lower maintenance and a higher standard of service, protect each transformer with G-E lightning arresters and fuse cutouts. →

GENERAL ELECTRIC COMPANY, SCHENECTADY, NEW YORK

GENERAL ELECTRIC

200-78

Olson Launches California Public Ownership Program

Three bills introduced into the California Legislature and a $250,000 item in the state's $557,000,000 biennial budget throw light on the public ownership program being launched by Governor Culbert L. Olson in connection with the Shasta Dam project.

Proposed legislative changes include an amendment to the present Central Valley Project act to permit the California Water Project authority to purchase existing facilities and add new units in addition merely to constructing the project. Other amendments would provide that a public agency distributing power may be required to pay equivalent sums in lieu of taxes; provide for the calling of advisory public elections in a given territory to ascertain whether the people desire public distribution of power; limit the amount of revenue bonds to be issued for new construction or purchase of facilities, and finally revise the procedure for issuing revenue bonds to comply with requirements of PWA. A second measure proposes to expedite the procedure for valuing public utility property for condemnation and a third amends the Water Conservation District Act.

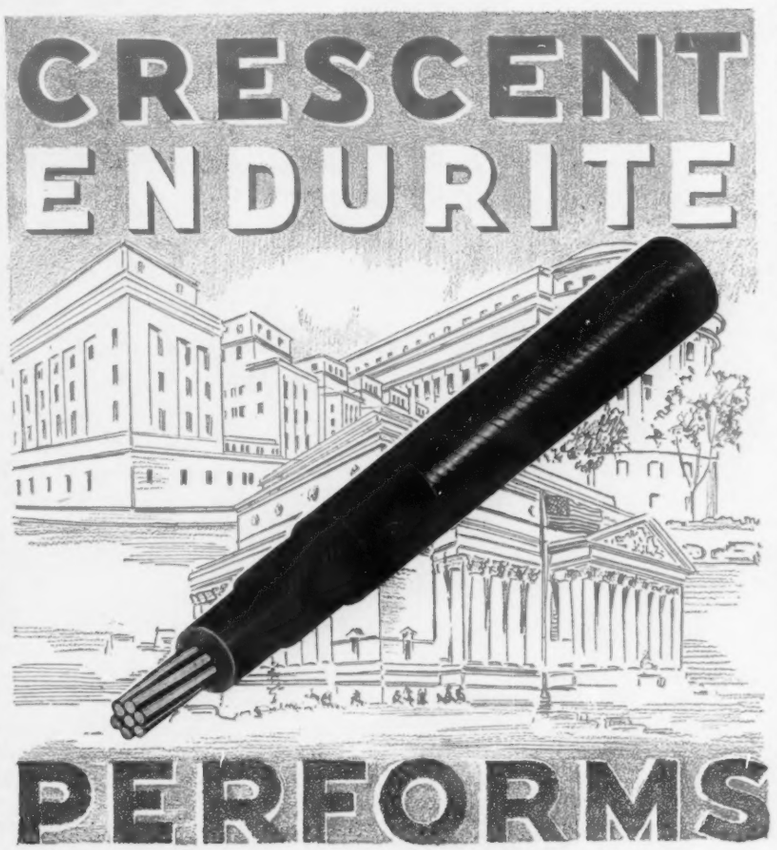
The $250,000 item is to cover preliminary studies and surveys for a steam-electric plant at Antioch, terminus of the 220-kv. line from Shasta Dam. Estimated cost of the plant, together with proposed transmission and distribution facilities is $20,000,000. Its purpose would be to firm up hydro power generated at Shasta Dam (only 60,000 kw. of the ultimate capacity of 375,000 kw. is firm) and to develop the market pending completion of the hydro plant. The steam plant and associated facilities would be financed by revenue bonds with a loan and grant from WPA.

More fully revealed is the gist of conversations between Governor Olson and Secretary of the Interior Ickes while the latter was on the Pacific Coast recently. Governor Olson proposed that negotiations be opened between the Water Project Authority and the USBR for a contract providing for administration and operation of the Central Valley project by the Authority, for the reimbursement of the USBR for the cost of the project by the Authority under the terms of the reclamation act and the securing of water and power contracts by the Authority from various public agencies. In addition to suggesting the construction of the Antioch steam plant, the governor proposed that the Authority assist in the formation of public power districts and that the Reclamation Bureau expand and speed up construction.

RUBBER COVERED POWER CABLE • BUILDING WIRE

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

VARNISHED CAMBRIC • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • ARMORED CABLE



ENDURITE Insulated Wires and Cables

Combine the Maximum in PERFORMANCE and ENDURANCE

PERFORMS:

They lower the cost of installation because of the ease with which they can be handled and pulled in; because the insulation is free stripping and leaves the copper conductor bright and clean to facilitate rapid connections; because of CRESCENT quality and superior service.

ADEQUATE WIRING SERVES AND SAVES

ENDURES:

ENDURITE Insulation is especially resistant to deterioration from heat and is suitable for operations at copper temperatures up to 75°C, permitting high current loads and installations in hot locations. Its superaging qualities assure maximum life and make it the wire to use for the toughest locations and important jobs.

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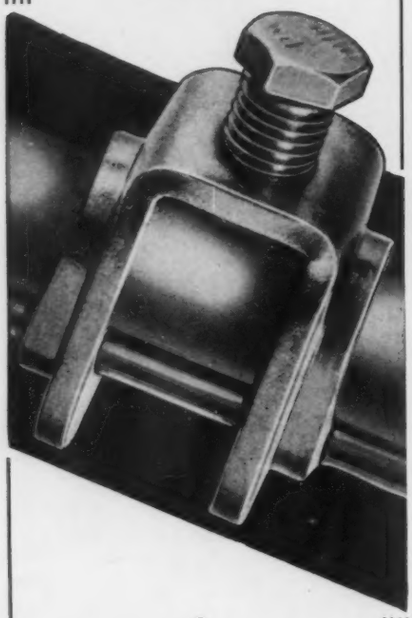
CRESCENT ENDURITE SUPER - AGING INSULATION

Reliable

GROUND ROD CLAMPS



• HIGH IN STRENGTH •

WITHSTAND CORROSION •

EASILY INSTALLED •

Made of Everdur for Copper and Copperweld Ground Rods. Made of Steel, Galvanized and Tinned, for Steel Ground Rods.

Everdur Clamps supplied with hollow head set screws when specified.

Reliable ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES

FEDERAL POWER COMMISSION last month said that the upper reaches of the Kings River in the Sierra Nevada range were the site of the next major Western power development. The commission's opinion was given to the House Committee on Public Lands in connection with the current fight over the creation of the John Muir-Kings Canyon National Park. Opponents of the park claim that placing this area under park control will prevent full utilization of the vast potential electric energy it is capable of producing.

Hydro Plant Soon to Be Built at Parker Dam

Construction of a hydroelectric power plant at Parker Dam on the Colorado River is to be started in the immediate future, F. E. Weymouth, general manager and chief engineer of the Metropolitan Water District of Southern California, said last month.

The district has signed a contract with the federal government under which the government will furnish funds for the plant and a transmission line to Phoenix, Ariz. The latter will supply energy to Central Arizona Light & Power Co. and the Salt River Valley Water Users' Assn. (ELECTRICAL WEST, March 1939).

The proposed plan is expected to result in a credit of approximately $6,800,000 to the water district, and will set forward by several years the construction of the power plant. The foundations for the plant, which eventually will supply power for pumping purposes on the 392-mi. Metropolitan Aqueduct, were built at the same time that Parker Dam was constructed to divert Colorado River water.

Under the contract, the government, which owns half of the power privileges at Parker Dam, will build and, for a number of years, will operate both its own and the water district's power generating units. It will credit the district with its share of the revenue received from the sale of power.

At present, the district is buying power from the government at Boulder Dam to operate its five aqueduct pumping plants. This source, Weymouth said, will supply sufficient power for pumping purposes for a number of years. When the district needs additional power for pumping, however, half the Parker power will revert to it.

During the period that the power plant is being built, part of the district's unused Boulder power will be delivered to Parker Dam over the existing transmission line, and thence to Phoenix over the new line to be built by the government as soon as Congress appropriates the necessary $1,300,000.

Reorganization Petition Filed by Portland Power

By filing in the federal court on April 3 a petition for reorganization of the Portland Electric Power Co., Franklin T. Griffith, president, took the first step presaged in his report to stockholders March 8. Object of the reorganization will be to protect the equity of the stockholders of the company and the owners of the company's collateral trust income bonds now in default as to principal and interest to over 30% of their face value.

Under the law the SEC will develop a plan of reorganization to submit to stockholders and bondholders.

Reasons for the default cited by Griffith were primarily three: (1) Failure of Portland Traction Co., wholly owned subsidiary of Portland Electric Power, to earn any net since 1930; (2) failure of Portland Electric Power's interurban electric railway to produce any net earnings, and (3) inability of Portland General Electric Co., Portland Electric Power's light and power subsidiary, to use its net to pay dividends on its stock.

The net earnings of Portland General Electric in recent years have gone for debt reduction and for betterments and improvements in the system. Griffith stated that the company, formerly able to find new investment money to finance additions and improvements, had been unable to market new bonds largely because of the "wide-spread fear of the investing public that the construction of the federal developments on the Columbia River might impair the financial stability of electric utilities."

DECLARING the Skagit project "is the product of the perspicacity, skill and industry of the late J. D. Ross," a resolution formally changing the name of Ruby Dam to Ross Dam was to have been introduced in the Seattle city council last month.

Northwest Engineers Stress Balanced Loadbuilding

Engineers turned out 235-strong April 19-22, in Seattle, for the 16th annual meeting of Northwest Electric Light & Power Assn.'s Engineering and Operation Section.

Association President LeRoy A. Grettum set a task for engineers in his opening address—that of learning to express the end-results of their work so the public can understand its value. This, he said, is the engineer's part in the selling job with which the industry is far from through.

Major H. S. Bennion, of Edison Elec-

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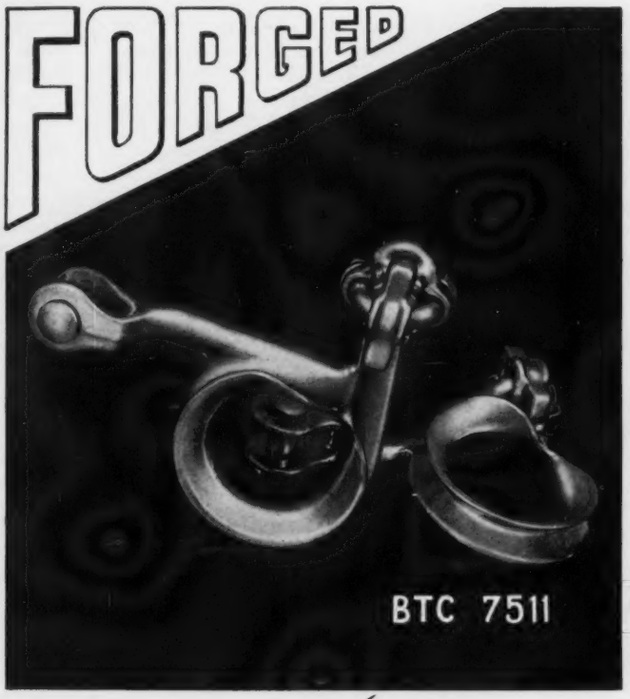

by BTC

Those who can recall Brewer-Titchener's early advertising in these pages will remember the stress placed on the advantages of a forging.

Those factors have become so well established that of recent years we have said little or nothing about them.

Today, the extra strength, lightness, uniformity and accuracy of BTC drop forged hi-line hardware are accepted as a matter-of-fact.

These advantages have always given the line an added margin of safety—sort of an insurance policy that is issued with every BTC forging.

We point to these years of service to the field and ask your consideration when specifying.

Through Your Insulator Manufacturer Only

FORGINGS

OF EXCELLENT QUALITY

Yes, you laugh and think this advertisement quite funny. In fact when we discovered this old photograph we did some chuckling ourselves.

When we found the photograph it was in pretty bad shape but we managed to restore it. There has been many a guess as to its age but some of the old timers around the plant claim that it is around thirty years old. Some of them even go further and claim they can identify the forging as an old Cadillac Fender Iron. As for ourselves; we are not going to make any claim what-so-ever. We had enough trouble trying to restore the print.

However, the hammer is one of the trip-hammer type. It actually hammers and is not to be confused with the drop hammers now used in the production of your hi-line hardware.

P. S. The moustache is real we guarantee no retouching.

Established 1834

BTC BTC

High Tension Suspension Line Hardware

THE BREWER-TITCHENER CORPORATION

Sell ranges with these units — and cash in on their many exclusive features. Use them for replacement, too—they fit all ranges.

CHROMALOX
Super-Speed **RANGE UNITS**

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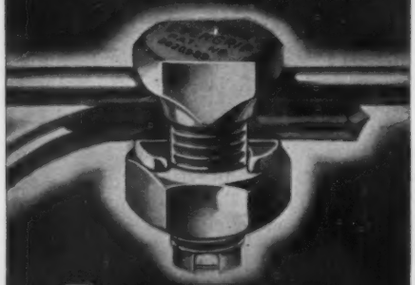
BETTER *Conductivity* *than a* **SOLID WIRE**



THE large head on the Blackburn Connector distributes the pressure on the wires over a large surface, producing a very low resistance connection. Tests show that the conductivity of the joint is actually better than the solid wire itself.

for
BETTER CONNECTIONS
SPECIFY *Blackburn*

JASPER BLACKBURN PRODUCTS CORP.
Main and Clinton Sts. St. Louis, Mo.

tric Institute, guest speaker, similarly pointed to the necessity for an engineering approach to loadbuilding. His talk reached a keenly interested audience. Lucidly analyzing system loads, he pointed out that re-examination of the system is a never-ending job, on the basis of which the engineer must help direct load growth. Direction of this growth, he said, should continuously be toward maximum benefit to the system —synonymously, its customers—considered as a whole.

In charge of the meeting was A. Vilstrup, chief engineer of B. C. Electric Railway Co. Three-day sessions represented much hard work and summed up a year's experience.

J. Hellenthal, of Puget Sound Power & Light Co., headed the general arrangements committee. Throughout the meeting, trips to White River hydro plant, Seattle underground, substations, Bremerton navy yard and other points of interest were scheduled.

The banquet Friday evening was without speakers or head table and included a variety of first-class entertainment, and was an informal, congenial climax to the meeting. (Reports and discussions will appear in the June issue.)

A. C. TODD, Salt Lake City contractor who was to have built a $2,600,000 municipal power plant for Ogden, Utah, late in March filed in court a $400,000 damage suit against Utah Power & Light Co. and 42 members of a citizens' committee. Todd claimed that an advertisement published during the municipal ownership fight, which was soundly defeated, was "false and defamatory" to his character.

CALIFORNIA'S SIERRA snowpack is this year only half a snowpack, the California Cooperative Snow Surveys reported last month. The mean for 15 watersheds is only 48% of normal. This is the lightest pack in five years. On the Western side of the Sierra, indicated run-off in the Kern watershed is high with 63% of normal, and the Merced low with 41% or normal. On the eastern side, the West Walker watershed is high with 47%, and the Carson low with 30%.

Bonneville News Hits New, Unprecedented Low

Death March 14 of Bonneville Administrator J. D. Ross has brought to a temporary stop the wealth of news emanating from Bonneville headquarters. The past 40 days' news totaled only three unimportant items.

First condemnation suit to acquire eastern Washington right-of-way for the Bonneville-Grand Coulee transmission line was filed in Spokane April 4.

The Oregon department of geology and mineral industries was seeking $1,000 with which to employ a metallurgical engineer who would study the possibility of utilizing salt deposits of Harney and Lake Counties in connection with a chemical or by-products plant near Bonneville.

Yakima, Wash., reservation Indians were pondering a Bonneville request for right-of-way across their domain. Among other questions, they asked if the government would light their tepees free.

EXTENSION of Sierra Pacific Power Co.'s lines all around Lake Tahoe will be completed this summer, C. E. Fletcher, general superintendent, has announced. Last connecting link from Glenbrook to near Sand Harbor is now under construction.

CALIFORNIA PUBLIC SERVICE CO. has announced a 40% reduction in commercial rates in Alturas, Calif. According to city officials, the reduction followed a growing movement instituted to provide the city with its own distributing system.

Contracts Awarded

TO PACIFIC ELECTRIC MFG. CO., San Francisco, for 28 disconnecting switches for the Bonneville project, $49,640; to Railway & Industrial Eng. Co., Greensburg, Pa., for three switches, $13,282.

TO GENERAL ELECTRIC CO., Portland, for three single-phase, 25,000-kva., 60-cycle transformers for the Bonneville project, $384,099.

TO E. J. LYNCH, San Francisco, for electrical work on ward building at Redwood City, Calif., $8,190; to Alta Electric & Mechanical Co., San Francisco, for electrical and mechanical work on children's building, $19,429.

TO G. H. ARMSTRONG, San Francisco, for electrical work on a local junior high school auditorium, $11,900.

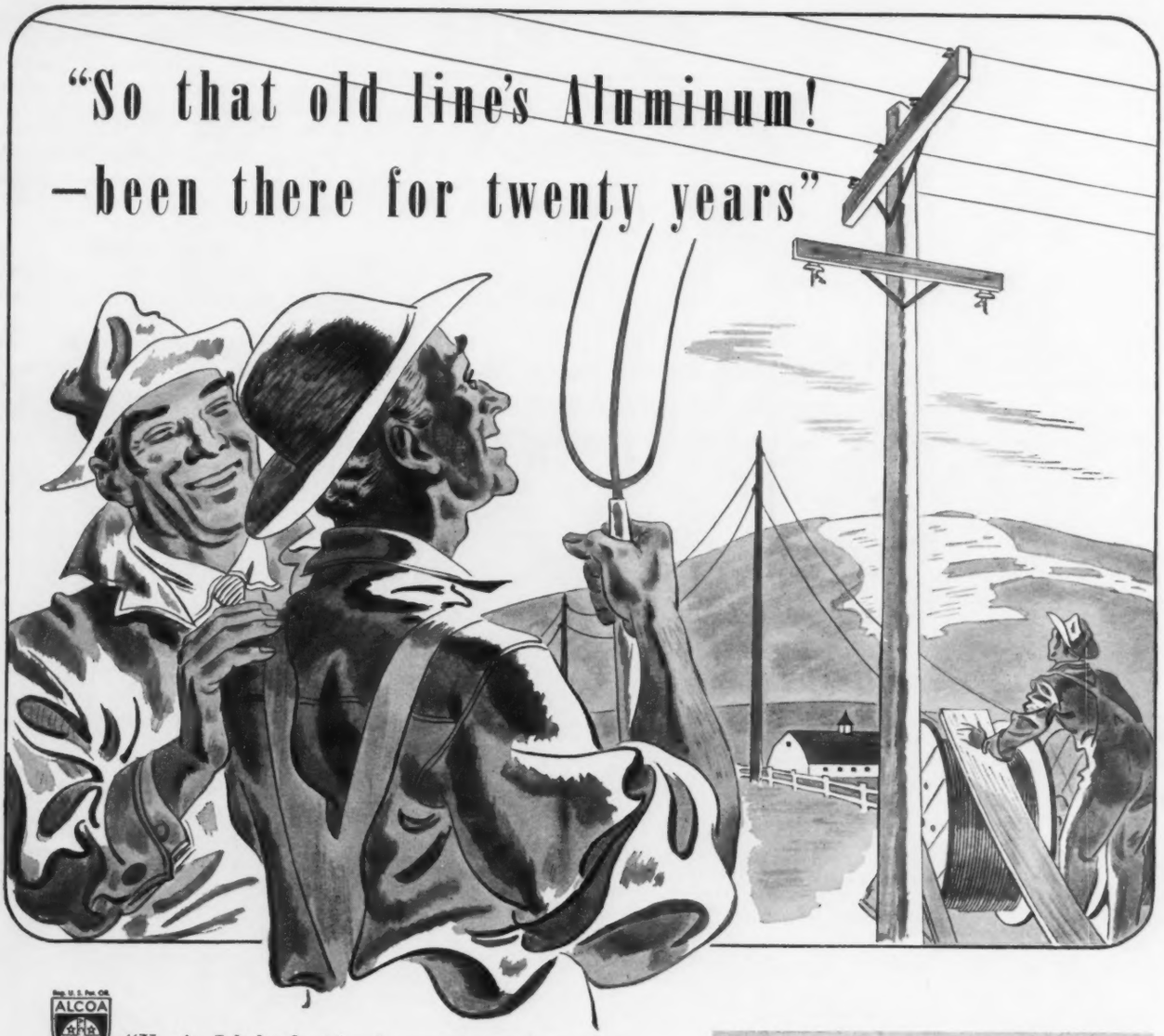
TO CORY & JOSLIN, INC., San Francisco, for electrical work on hospital for Homeopathic Foundation of California, San Francisco, $11,200.

TO WAGNER ELECTRIC CO., Tacoma, for three 1,000-kva. transformers for the Tacoma Lighting Dept., $7,050; to Kelman Electrical & Mfg. Co., for modernizing two oil-circuit breakers, $5,688.

TO JOSLYN CO. OF CALIFORNIA, Los Angeles, for galvanized steel strand for overhead ground wire for third Los Angeles-Boulder Dam circuit, $152,498.

TO PARKER SCHRAM, Portland, for constructing Bonneville transmission line from Ampere, North Vancouver, Wash., to Eugene, Ore., $120,933.

TO INTERNATIONAL DERRICK & EQUIPMENT CO., Torrance, Calif., for structural steel for bus



"Yessir, I helped string it across your farm. The line's seen plenty of tough weather since then, too, and it's good for another twenty years. Your new line'll certainly be all right with the same stuff in it."

Trust the judgment of men who must face year 'round weather. A.C.S.R. lines have what it takes to stand up under adverse conditions — scorching summers, severe winters, sleet storms and high winds. This has been proved on thousands of miles of line, for more than 25 years.

A.C.S.R. has the high strength which permits long span construction with high safety factors. It provides the conductivity needed for future growth of load. Because it is highly resistant to corrosion, long life is assured. A.C.S.R. construction standards assure low building costs and a minimum of maintenance. ALUMINUM COMPANY OF AMERICA, 2132 Gulf Building, Pittsburgh, Pennsylvania.

A·C·S·R

Aluminum Cable Steel Reinforced

FOR RURAL LINES AND POWER TRANSMISSION

structure extension for City of Los Angeles, Boulder switchyard, $19,744.

To General Electric Co., Schenectady, for peterson coils for Seminoe power plant; Cheyenne substation, Kendrick project, and Gering substation, $25,656; to Allis-Chalmers, Milwaukee, $27,392.

To Mott Electric Co., New Westminster, B. C., for electrical work on addition to local post office.

To Delta-Star Electric Co., Chicago, for 287,000-volt, three-pole disconnecting switches for third Boulder circuit, $95,000.

To Bethlehem Steel Co., Bethlehem, Pa., for structural steel for steel structures for Seminoe power plant, Kendrick project, $6,192.

To Ed Honnen Construction Co., Colorado Springs, Colo., for power-plant and steel penstock installation for local municipal power system, $217,606; to Taylor Forge & Pipe Works Co., Chicago, for pipe and fittings, $200,143; to Pelton Waterwheel Co., San Francisco, for turbine and installation, $18,533; to Westinghouse, Denver, for generator and installation, $19,408.

To Industrial Electric Co., Aberdeen, Wash., for electrical work on cannery and shore pilchard plant at Hoquiam, Wash.

REA Activities

Overton (Nev.) Power District No. 5 has received two allotments totaling $49,000 to complete the project.

Delta-Montrose Rural Power Lines Assn., Delta, Colo., has been allotted $68,000 to build 84 mi. of line in those counties. The association has also been allotted $5,000 to finance house-wiring and plumbing installations.

Plumas-Sierra Rural Electric Cooperative, Blairsden, Calif., has been allotted $25,000 to build 15 mi. of line in Plumas and Lassen Counties. The cooperative also filed with the FPC application for license for transmission lines with a total length of approximately 250 mi. in Lassen, Plumas and Sierra Counties.

Central Valley Electric Membership Corp., Artesia, N. M., has been alloted $24,000 to be added to $125,000 previously allotted for building a generating plant and constructing 75 mi. of line in Chavez and Eddy Counties.

Residents of Scotch Creem and Conconully, Wash., last month were preparing to form a rural electrification project and apply for federal funds.

Fall River Rural Electric Cooperative, Ashton, Ida., has been allotted $80,000 to build 62 mi. of line in Fremont County.

Missoula (Mont.) County Electrification Assn. has been allotted $25,000 to build 21 mi. of line in Missoula and Granite Counties.

Fergus County Cooperative Electric Assn., Lewistown, Mont., has been awarded $130,000 to build 120 mi. of line in Fergus and Judith Basin Counties.

Trinidad (Colo.) Electric Transmission, Railway & Gas Co. has been alloted $39,000 to build 31 mi. of line in Las Animas County.

TRADE NOTES

Boyd and Vance Buy Gilson Electrical Supply

Purchase of an electrical wholesale house by a manufacturer is not an infrequent occurrence; but when contractors buy a wholesale business, that's news. In Oakland last month, two electrical contractors, Frank E. Boyd and Walter D. Vance, bought Gilson Electrical Supply Co., oldest and one of the largest wholesale concerns in the East Bay district.

Ownership of Gilson Electrical Supply Co. changes hands as Frank E. Boyd (seated, left) and Walter D. Vance (standing) watch Henry I. England, former owner sign the sales agreement

Ownership of the firm was acquired by purchase of the capital stock from Henry I. England, for 20 years owner and manager. England remains with the company in a sales and advisory capacity. He will also continue to represent the company in the NEWA.

New president of the firm is Boyd; vice-president is Vance. Both men are known to the trade for their operation of Pacific Electric Motor Co., Oakland.

W. C. Figroid, recently resigned as purchasing agent of Pacific Electric Motor, is new manager of the Gilson organization and in charge of purchases.

Dealers and Distributors

C. J. McDowell, Victoria, B. C., plumbing and heating firm, has opened a new showroom featuring electrical appliances at 1205 Douglas St. Ranges and refrigerators are handled, as in the past, at the 1000 Douglas St. showroom. J. B. Morgan is manager of the new room; Allan Wright is in charge of range sales and service.

Charles E. Montgomery has registered his partnership in the Service Electric Shop, Vancouver, B. C.

McLennan, McFeely & Prior, Ltd., has remodeled the ground floor of its retail store on Government St., Victoria, B. C., and installed a large retail electrical appliance department.

J. C. Louet and C. Gladwin have opened a new appliance and supply store in North Vancouver, B. C.

Hunter Hardware, Vancouver, B. C., hardware and appliance store, has changed its name to Pitt & Hunter, Ltd.

Sherman Clay stores have been appointed additional West Coast retail outlets for Stewart-Warner radios. The chain comprises 11 stores in principal coast cities.

Archie Doughty, Livingston, Mont., appliance dealer, has taken on the Westinghouse line of ranges.

Maytag Shop, Billings, Mont., has taken on the Hotpoint line of electric appliances. Pat Ewing is in charge of city sales for the store.

C. C. Anderson Store, Logan, Utah, has installed an electrical appliance department. R. G. Call and Rulon Maughan are in charge.

Wible Radio Supply, Tacoma, has been bought by Charles Wible and will henceforth concentrate on the transformer business.

General Sales Co., Seattle, has been appointed distributor for the Radio City Products line of servicemen's test equipment.

Contractors

Mott Electric, Ltd., New Westminster, B. C., contracting establishment, has opened a branch office in Vancouver.

Nixon's Ltd., electrical contractor and appliance dealer, has discontinued its business at 1207 Douglas St., Victoria, B. C.

J. Hoogerwerf, proprietor of Standard Electric, Nelson, B. C., has completed the electrical installation at the motor-truck sales and service depot of the Central Truck & Equipment Co., Nelson.

Utilities

First issue of a new advertising and selling publication for electrical appliance salesmen in its territory was

smooth sailing with **TRIANGLE**

TRIANGLE PRODUCTS REWARD BUYERS!

TRIANGLE CONDUIT & CABLE COMPANY, INC.

Horace Harding and Queens Blvds.
Elmhurst, New York City, N. Y.

Pacific Coast Division: C. C. Hillis, Vice-President in Charge of Sales, 390 Seventh St., San Francisco, California

PRINT IN BINDING

HERE'S HOW!
Better Electrically
Stronger Mechanically
1 SKIN WIRES
2 SCREW ON
THAT'S ALL!
No Twisting of Wires Necessary! Wires are automatically twisted and threaded together 'n "Wire-Nut" is applied.

IDEAL

Wire-Nuts

(Solderless Tapeless Wire Connectors)

MILLIONS IN USE!

Fully Approved Samples on Request

ELECTRICAL PRODUCTS DIVISION

Ideal Commutator Dresser Co.

1042 PARK AVENUE, SYCAMORE, ILLINOIS

Banking FOR THE Professions

Doctors, lawyers, dentists, engineers, teachers — all those whose time is precious—appreciate our Bank-by-Mail service. It enables them to do their banking when most convenient, night or day. Safe. Fast. Reliable. Overnight to most points in California.

Write today...

for free Bank-by-Mail kit containing all necessary forms, return envelope and simple instructions.

CROCKER FIRST NATIONAL BANK

OF SAN FRANCISCO

California's Oldest National Bank

Member Federal Deposit Insurance Corporation

issued last month by B. C. Electric Railway Co.

HAWAIIAN ELECTRIC Co. has redecorated its fixture department display rooms the better to sell lighting. To help customers visualize the way a lamp will look in their homes, the rooms are equipped with furniture similar to that most frequently used in Honolulu.

FIRST ISSUE of the *Sales Builder*, official publication of the Inland Empire (Wash.) Electrical Equipment Assn., appeared March 20. The paper replaces the old *Electrical Sales News*.

Manufacturers

L. C. BRADY, Denver, has been appointed Proctor Electric Co.'s representative in Wyoming, Colorado, New Mexico and eastern Montana.

W. D. HOWZE SALES Co., Los Angeles, has been appointed representative for Everstick Anchor Co. in California and Arizona.

Moved

BILLINGS (MONT.) NORGE Co. to 201 N. 30th St. A feature of the store is a service department for the servicing of all makes of appliances.

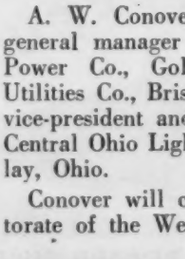
THOMAS & BETTS Co.'s San Francisco office and warehouse from 735 Tehama St. to 542 Natoma St.

ABOUT PEOPLE

A. W. Conover Promoted; Succeeded by C. C. Baker

A. W. Conover, vice-president and general manager of Colorado Central Power Co., Golden, and Oklahoma Utilities Co., Bristow, has been elected vice-president and general manager of Central Ohio Light & Power Co., Findlay, Ohio.

Conover will continue on the directorate of the Western companies. He will also continue to supervise the public relations activities of the properties on the Crescent Public Service group, as well as the east coast properties.



CONOVER

Succeeding him as general manager of the Colorado company is C. C. Baker, for 12 years secretary-treasurer of the company.

Under Baker's management, Earl E. Eckstrom becomes manager of the Littleton-Englewood district, succeeding F. K. Godwin.

Ben Franklin Club Names A. W. Rockwell President

A. W. Rockwell, San Francisco district manager of Appleton Electric Co., has been elected president of the Ben Franklin Electric Club of Northern California. He succeeds S. P. Gregory, Arrow-Hart & Hegeman Co.

Grover Anderson, Harvey Hubbell, Inc., is first vice-president; H. J. Newton, Pacific Coast manager of National Electric Products Co., second vice-president, and H. Q. Noack, Hubbard & Co., treasurer.

Changes Made in Denver by G-E Supply Corp.

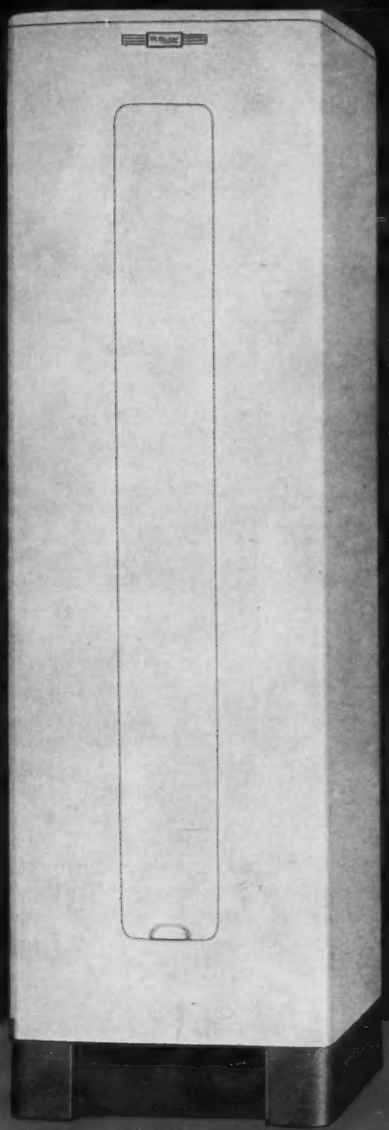
E. E. Brazier, Denver branch manager of General Electric Supply Corp., has announced the following changes in his organization:

John M. DePue is branch sales manager. A. H. Colson is appliance specialist in the territory north of Denver; Marvin J. Baker holds a similar position south of Denver.

E. D. Heintze is supply salesman in the Denver area formerly covered by H. M. Olmstead, who has been transferred to the office organization. Guy A. Herron, a new staff member, is contacting customers previously served by Baker and Olmstead. Wayne E. Borth is in charge of the new sales promotion department.

RAY BYGEL, former assistant manager of General Electric Supply Corp., Denver, has been named manager of Electric Supply Co., new Albuquerque, N. M., jobbing organization which will handle all kinds of electrical supplies, including lighting equipment, but for the present will stay out of the appliance field. Also connected with the new company is Miss Mildred Fares, for the past four years lighting specialist for Albuquerque Gas & Electric Co.

ROY MARTINDALE has been appointed electrical engineer in charge of operations for Los Angeles Bureau of Power & Light. He succeeds the late Thomas A. Panter. Martindale has been assistant engineer in charge of operations for a number of years.



GET VOLUME SALES NOW WITH SPECIAL PROMOTION PLAN ON HOTPOINT VOGUE

The World's Most Popular Water Heater

LIMITED TIME ONLY Plan a Water Heater Sales Drive using the popular Hotpoint **VOGUE** square-type heater as leader. Hotpoint offers a special promotion plan complete with sales material and a great method for stimulating sales of the world's favorite-style water heater, NOW!

EXCLUSIVE FEATURES GIVE ADDED VALUE

Hotpoint set a new water heater style trend for the trade and public by pioneering the square-type water heater—now a great industry favorite. But only Hotpoint-built water heaters provide **CALROD**, the sealed heating unit immersed within the tank; **THERMOSNAP**, Hotpoint's automatic temperature control which makes Hotpoint water heaters safely automatic.

DESIGNED BY INDUSTRY LEADERS . . .

With nearly thirty years of experience in the industry, Hotpoint, world's largest manufacturer of electric water heaters, has pioneered more exclusive features than any manufacturer in the field. Hotpoint provides greater opportunity for bigger profits faster by offering the most complete line, capacities from 1 to 140 gallons, and the most complete sales promotion plans.

GET IN NOW ON HOTPOINT'S BIG SPECIAL WATER HEATER PROMOTION PLAN

THE VOGUE, Hotpoint's tremendously popular RECTANGULAR type Electric Water Heater is the mainstay of the new sales promotion plan. It's a favorite with home owners everywhere. The new plan is supported by folders, broadsides, manuals and window trims. It offers you a great opportunity to cash in on the rapidly growing profits of electric water heating. The campaign is all set up ready to go to work for you. See your distributor now.

THE VOGUE

Hotpoint's RECTANGULAR-type Water Heater, now standard of the industry, and increasing in public popularity, combines smart modern styling with Hotpoint's proved economy and efficiency. THE VOGUE is styled to fit in the modern Kitchen, basement playroom or bathroom.

VOGUETTE 2 GALLON

Hotpoint's new non-pressure water heater. Easily and quickly installed. Can be plugged into any convenience outlet. Opens new markets in residential and commercial fields.

CALROD

Hotpoint's bakelite-sealed, airtight heating unit is immersed directly in the water inside the tank. All heat generated is delivered directly to the water. There is no flame—no fire hazard—no waste. Efficient, economical, and long of life. Service-free performance.

EDISON GENERAL ELECTRIC APPLIANCE CO., Inc., 5612 W. Taylor St., Chicago, Illinois

WATER **Hotpoint** HEATERS

ELECTRIC RANGES • REFRIGERATORS • WASHERS AND IRONERS • DISHWASHER-SINKS

A. J. Lutz Transferred To Chicago by GESCO

A. J. Lutz, for the past 15 years Seattle district manager of General Electric Supply Corp., this month became district supply sales manager at Chicago.

Announcement of the appointment was made by J. L. Busey, company president, who flew to Seattle to announce the creation of a new North Pacific district office under the direction of H. C. Gerster, former Western regional sales and appliance supervisor at San Francisco. The new district is a consolidation of the old Seattle and Portland districts and will include eastern Washington.

Fred A. Block, Lutz's assistant and formerly district appliance sales manager, is district supply sales manager for the new office.

Warren Bruce, operating manager of the Portland office, is operating manager for the new office. To fill his position, Bruce Winship, operating manager at Seattle, has been transferred to Portland.

Lutz started work for the company in San Francisco. During the years he worked in Seattle he was active in industry activities, at one time heading the Electric Club of Washington.

JOSEPH L. MULLENBACH, founder of Mullenbach Electrical Mfg. Co., Los Angeles, has retired from active business. The company is now operated by his three sons, Charles, Paul and Robert.

WILLIAM IRISH is the new assistant sales supervisor for Maxwell & Franks, Spokane contracting establishment.

C. A. PURVIANCE had low gross score in Los Angeles Electric Club's annual golf tournament April 3. Low nets in various flights were shown by A. D. Brown, W. J. Wilt, G. E. Arbogast, E. R. Northmore, P. W. Todt, E. S. Condon, C. P. Garman, A. L. Loman and E. F. Gould, Jr. In charge of the affair were Graham Holabird, C. P. Altland, D. A. Smith, E. W. Rockwell, R. E. Fife, W. E. Listenwalter, E. V. Kane and J. A. Long.

LORIN WILLIAMS, for the past year manager of the Gamble store in American Fork, Utah, has resigned.

J. H. VOLLMER, formerly connected with Colorado Power & Light Co. and Kyle Electric Co., Pueblo, Colo., has been appointed domestic appliance salesman by James V. House, Livingston, Mont., Frigidaire dealer.

DAVID R. BAKER has been appointed manager of Tork Clock Co., Inc., Mt. Vernon, N. Y. Active in the early development of the company, he has for the past year been doing special work for the organization in Los Angeles.

HOMER C. BENDER, Washington Water Power Co. air-conditioning engineer, has been awarded a $1,000 prize for his entry in the recent nation-wide General Electric "electrical standard of living" contest. The award was one of 20 made to home-owners in the contest, which was designed to impress prospective builders, modernizers and consumers with the advantages of a modern home.

W. A. BITCON, formerly connected with the Vancouver office of B. C. Electric Railway Co., has been appointed company sales representative at Kamloops, B. C.

BURT MOORE has been named manager of the Norge Appliance Store, Bozeman, Mont.

FRANK D. WALLACE, for the past several months southern California district manager for Horton Mfg. Co., has been named West Coast sales manager for the company. He will be responsible for sales in California, Oregon and Washington. Wallace has spent the last 12 years on the coast in washing-machine sales activities.

C. W. GILNER, owner and manager of Gilner Electric, Salt Lake City, has qualified as a cabinet member of the General Electric Toppers' Club as a result of his outstanding work in selling G-E appliances in 1938. Roy Staley, of Goggans & Pennie, Great Falls, Mont., G-E dealer, has been made a member of the club.

A. A. HAMILTON has joined Western Montana Electric Co.'s sales force.

HARRY A. WEIL, JR., formerly with Curtis Lighting, Inc., and later with Kurt Kersen Co., New York, has been put in charge of the lighting and engineering division of H. E. Saviers & Sons, Inc., Reno.

Deaths

ROBERT B. CHILDS, assistant general manager of Washington Water Power Co., died March 31 while in California. He had been ill for about three months. Mr. Childs joined the company in 1923 and was made assistant general manager in August 1930. He was appointed manager of the Spokane division Jan. 1, 1939, when the company adopted the divisional plan of operation. He was also assistant general manager for Spokane Central Heating Co. and Spokane United Railways, subsidiaries of the power company.

H. W. CROZIER, pioneer Pacific Coast consulting electrical engineer, died at Covina, Calif., April 13. Mr. Crozier first went to work for Independent Light & Power Co., San Francisco, one of the predecessors of Pacific Gas and Electric Co. Later he was with Sanderson & Porter, consulting engineers, and for many years was in charge of their San Francisco office. At that time he served in an advisory capacity to various Federal Light & Traction properties in the West. More recently he was an independent consulting engineer with offices in Las Vegas, Nev., where he supervised the design and construction of the Lincoln County Power District transmission system from Boulder Dam to the Pioche mining region in Nevada.

HIRAM W. WADSWORTH, 76, known as the "father of the Metropolitan Water District" died April 12 in Pasadena, Calif. He played a major part in plans to bring Colorado River water to southern California.

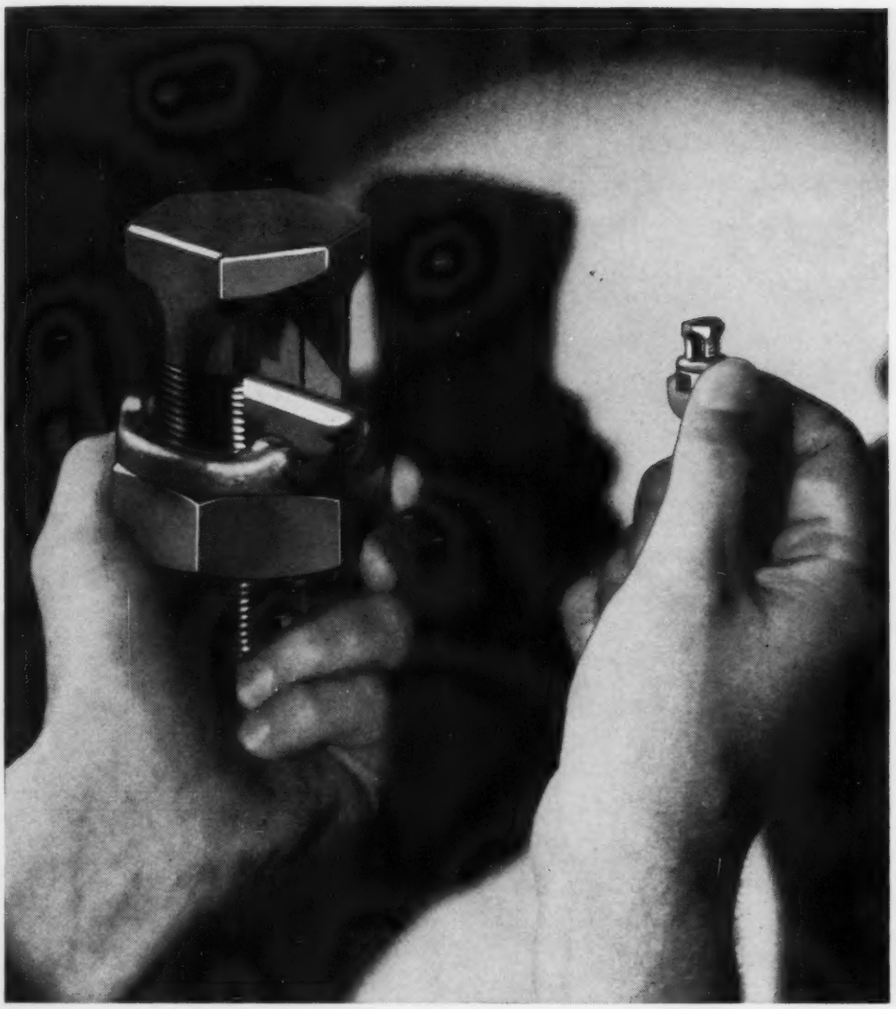
Speakers

At the launching of the Electric Appliance Society of Northern California's refrigeration campaign for Sacramento —L. C. Schroeder, Schroeder's, Sacramento, president of the Sacramento unit; O. E. Rush, appliance society; J. O. Tobey, superintendent of P. G. & E.'s Sacramento division. The meeting was held at the historic Folsom power house, pioneer power house of the P. G. & E. system.

At the largest appliance meeting ever held in Portland, this time for the purpose of presenting the Modern Kitchen Bureau's program—Dr. E. W. Allison, of the bureau; A. C. McMicken, Portland G. E.; George Wisting, Northwestern Electric.

At the Pueblo, Colo., meeting under the auspices of the Rocky Mountain Electrical League—Fred Voss, Phillips Music Co., president of the Pueblo league; G. W. Milliken, vice-president in charge of sales, Southern Colorado Power; F. H. Harrigan, field representative of the Modern Kitchen Bureau.

It's a KEARNEY PRODUCT



YOUR QUESTIONS OUR ANSWERS

Q. Is it a construction feature that prevents binding and cross-threading of nuts on Kearney Cold Drawn Compressed Con-Nec-Tites?

A. Yes, improved, clean threads throughout the length of the bolt assure proper engagement of nut, minimize nut friction and transmit most of the exerted torque into pressure between wires, giving maximum conductivity.

Q. How is the distribution of the load on the nut accomplished to produce maximum pressure between conductors?

A. The patented full-round washer used on Kearney Con-Nec-Tites affords a smooth, low friction bearing surface for the nut, thus developing maximum pressure between conductors.

Q. As the world's largest producer of Solderless Wire Con-Nec-Tites, what selection does the Kearney Corporation offer?

A. There are 75 Standard Kearney Con-Nec-Tites—in sizes from 1,000,000 CM to the small No. 10 . . . available in Cold Drawn Type, in either iron, copper or aluminum . . . or in the Screw Machine Type, in brass, bronze or aluminum bronze.

Q. Why are Kearney Con-Nec-Tites made in the above variety of materials?

A. Because it permits operators to select connectors of materials similar to line conductors and also permits them to meet their individual specifications.

MILLIONS *in Service*

More than 10 years have passed since the first Kearney Solderless Wire Con-Nec-Tites were introduced to the field and put into service.

Since 1927, millions have been installed for better electrical and mechanical connections and assurance of safety heretofore impossible with the old hazardous soldering methods.

To hear from operating men and friends in the industry that we have produced a product which is a worthwhile contribution to the reduction of operating costs, and a large factor in promoting less accidents and greater safety, is most gratifying.

Naturally, to develop a product which is so well accepted is a pleasure to this company. Our record of 10 years' production and improvement of Con-Nec-Tites, and our position as the world's largest manufacturers of these products, shall be carefully preserved and protected.

Send for Prices and Information.

Solderless Con-Nec-Tites; T-Con-Nec-Tites; Lap-Tite Connectors; Trip Out Fuse Switches; Trip-O-Link Fuse Switches; Trip-Saver Fuse Switches; One and Two Insulator Fuse and Disconnect Switches; Porcelain Housed Tripomatic Fuse Cutouts; Double Duty Fuse Cutouts; Pole Top Gang Operated Switches; Porcelain Housed Disconnect Switches; N.E.M.A. Hook Operated Disconnect Switches; Fuse Links; Fuse Link Boxes; Fuse Pullers; Secondary Fuses; Screw Anchors; Expansion Anchors; Full-Vu Guy Guards; Guy Wire Clips and Strand Bands; Economy Cable Clamps; Dead-End Service Clamps; V-Groove Service Clamps; Hitemeters; "J" Hooks; Conduit Straps; ABC Sleeves and Machines; Cable Ring Saddles; Fit-Rite Wire Holders; Sleeve Twisters; Ground Wire Clips; Ground Clamp-Tites; Grounding Cable; Hi-Line Tools Accessories; Con-Nec-Tap Clamps; Grounding Sets; Masterenches.

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO

The Mark of Quality Products

Exclusive Sales Representatives

MAYDWELL & HARTZELL
INCORPORATED
LOS ANGELES • SAN FRANCISCO • PORTLAND

EXCLUSIVE DISTRIBUTORS
GRAYBAR ELECTRIC CO., Seattle, Portland, Tacoma, Spokane • WESTINGHOUSE ELECTRIC SUPPLY CO., Phoenix • J. R. BRADLEY CO., Reno

Index to Advertisers

MAY, 1939

Aluminum Company of America..... 61
American Steel & Wire Co..... 55

Blackburn Products Co., Jasper..... 60
Brewer-Titchener Corp., The 59
Burndy Engineering Corp. 4

California Oregon Power Co.....34, 35
Columbia Steel Co. 55
Crescent Ins. Wire & Cable Co..... 57
Crocker First National Bank..... 64

Driver-Harris Co. 14

Edison Gen. Elec. Appliance Co., Inc. 65
Electrical Testing Labs..... 14

G. C. A. Mfg. Co..... 14
General Cable Corp. 5
General Electric Company.....1, 10, 12, 13, 49, 56
Graybar Electric Company..... 18

Honn Co., Geo. E..... 8
Huntington Hotel, The..... 8

Idaho Power Company.....34, 35
Ideal Commutator Dresser Co..... 64
Indiana Steel & Wire Co..... 14

Jeffries Transformer Co..... 4

Kearney Corp., James R..... 67

Landers, Frary & Clark..... 6
Line Material Co. 3

Maydwell & Hartzell, Inc..... 67
Montana Power Company, The...34, 35

Pacific Coast Elec. Bureau....4th Cover
Pacific Gas and Electric Co...3rd Cover
Portland General Electric Co.....34, 35
Puget Sound Power & Light Co...34, 35

Reliable Electric Co..... 58

Schweitzer & Conrad, Inc..... 9
Southern California Edison Co. Ltd. .....2nd Cover
Square D Company..... 11
Superior Switchboard & Devices Co. 51

Tork Clock Co., Inc..... 14
Triangle Conduit & Cable Co..... 63

United States Steel Corp..... 55
Utah Power & Light Co.....34, 35

Ward Leonard Electric Co..... 51
Washington Water Power Co.....34, 35
Westinghouse Elec. & Mfg. Co. 15, 17, 52, 53
Wiegand Co., Edwin L..... 60
Wiremold Company, The..... 7

PROFILES OF THE MONTH

"Unless a blizzard completely blots out Coeur d'Alene and our surrounding territory, we'll win it again in 1939," declared L. R. Wood, division manager of Washington Water Power Co., who, with Division Sales Manager Art Mayer, was honored with a dinner and a trophy for winning the company's annual 1938 light-conditioning campaign. Above, Lewis A. Lewis, assistant general manager of the company, presents the trophy, consisting of an illuminated stand inscribed with the winner's name, to Wood and Mayer. This year the campaign period during which all electrical dealers in the utility's territory expect to promote the better light-better sight movement is September 1-January 1

W. P. L'Hommedieu, Westinghouse manager in the San Francisco area for the past 8 years, was appointed Pacific Coast Central Station and transportation manager effective March 1. L'Hommedieu joined the San Francisco office, which will remain his headquarters, in 1910 as railway & power equipment salesman

F. H. (Jack) Harrigan, Pacific Coast field representative of the Modern Kitchen Bureau, presents his organization's program to the San Joaquin Power advertising committee. Left to right, the conferees are: Gerald F. Thomas; A. D. Church, in charge of advertising for the utility; Harrigan; E. G. Stahl, general commercial manager; Kenneth Hampton, store manager, and Norman Eichelberger. Harrigan also helped the men set their sales plans for 1939

William A. Lewis, Jr., 35, Westinghouse engineer at Pittsburgh, is new director of Cornell's School of E. E. A Caltech graduate, Lewis joined the Westinghouse staff in Los Angeles in 1922. He is one of Cornell's youngest executives

In the display contest conducted by the General Electric home laundry equipment section for dealers producing the most effective windows, Prottas & Levitt, Seattle, was awarded third prize. C. J. Anderson (right) G-E home laundry district representative, presents a check to N. E. Condon, manager of the store's electrical department. Rudy Hillman of the store is at the left; F. A. Block, district appliance sales manager of G-E Supply Corp., Seattle, is between Anderson and Condon

Preview of coming campaigns by

P·G·and E·

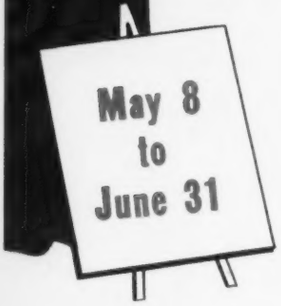
PACIFIC GAS AND ELECTRIC COMPANY

ELECTRIC APPLIANCE SOCIETY OF NORTHERN CALIFORNIA

MAY

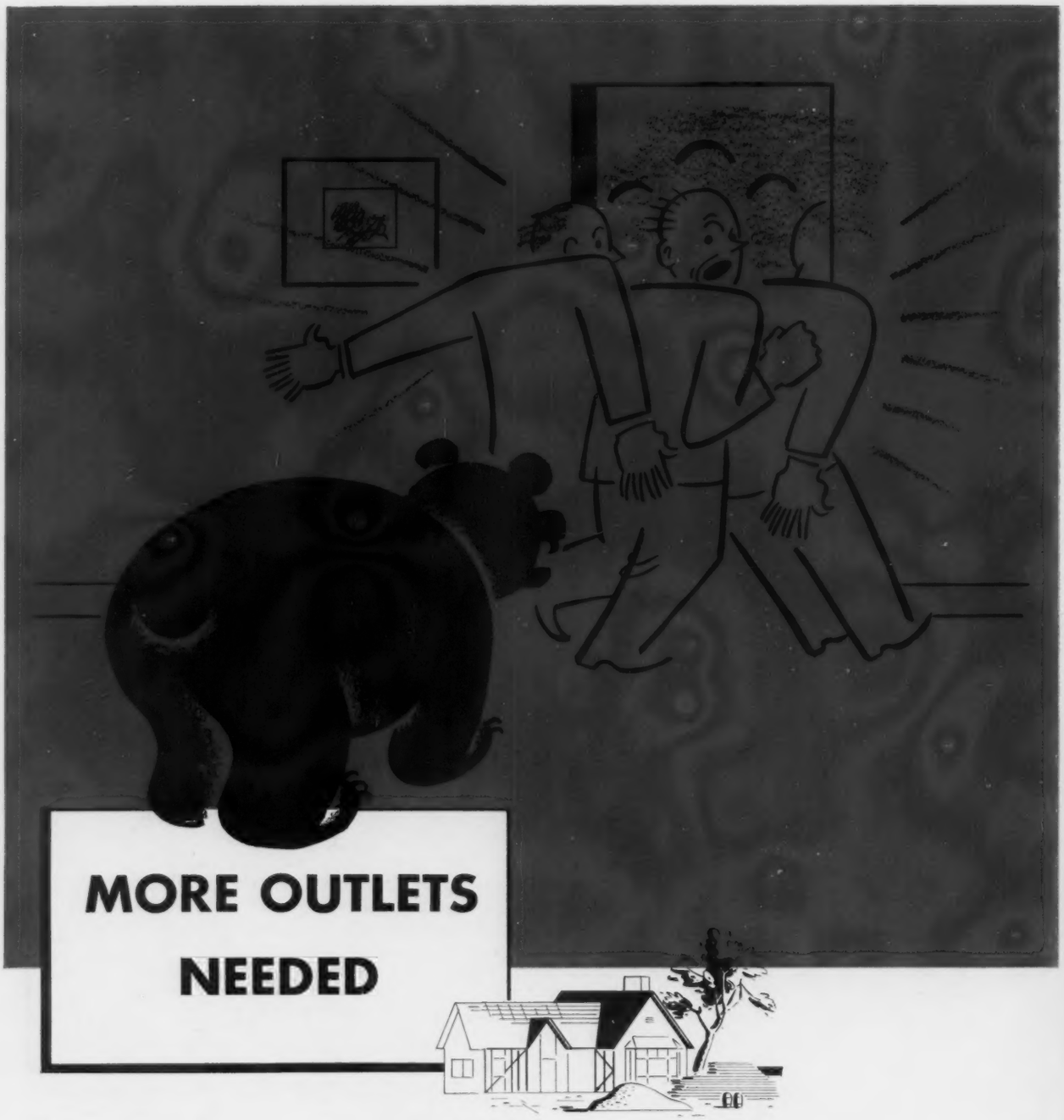
ELECTRIC RANGE CAMPAIGN

COMING, as it does, immediately after a national magazine campaign on electric ranges—the "guess again" campaign—this local event has the advantage of considerable advance preparation. And so we won't lose any valuable momentum, we're borrowing the "guess again" theme and tying it in with our unusually favorable cooking rates. ¶ Newspaper advertising will appear weekly during the period of May 8 to June 31 throughout our exclusive electric territory, and for the week of June 5, the campaign will extend to our entire electric territory. ¶ Newspaper advertising will be supplemented, as usual, with window displays, poster advertising on billboards, truck signs and billstickers ¶ If you handle electric ranges and wish to tie in with these efforts, see our local office —today!



DEALERS: By watching this page from month to month you can keep informed of sales promotional campaigns to be sponsored by the Pacific Gas and Electric Company and the Electric Appliance Society. Detailed information will be supplied, as usual, through the mail. If such information is not received, call our local office or write Electric Appliance Society, 1355 Market St., San Francisco, Calif.

EW 105-539



In our industry, we're strong on appliance sales, but short on selling the idea of having enough electrical outlets to insure their proper use. The result is pretty sure to mean a dissatisfied customer and that hurts everybody. Every branch of the industry—manufacturer, wholesaler, contractor, dealer and utility—has a vital stake in the campaign to promote better electrical facilities in the American home. "More Outlets in Use" should be our goal for this year and all the years to come.

5-39

PACIFIC COAST *Electrical* BUREAU

447 SUTTER STREET, SAN FRANCISCO • [illegible] WEST 5TH STREET, LOS ANGELES